

3.2

Site:	Wells G&H
Break:	3.2
Other:	

RESIDENTIAL INDOOR AIR SAMPLING RESULTS

WELLS G&H SUPERFUND SITE

WOBURN, MASSACHUSETTS

JUNE 1989

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1.0 Introduction

1.1 Description

Groundwater contamination has been determined to exist within the 330-acre Wells G&H Superfund Site located in Woburn, Massachusetts. The site is bordered by Interstate 95 to the north, Interstate 93 to the east, Cedar Street and Salem Street to the south, and B&M Railroad to the west. Contaminated groundwater originating from Unifirst Corporation and W.R. Grace is traveling beneath residential homes in the Dewey Avenue area. A shallow water table has been determined to exist beneath some of these properties, especially along Dewey Avenue. The Massachusetts Department of Public Health(MA-DPH), working in conjunction with the Agency for Toxic Substance and Disease Registry(ATSDR), have expressed concern that volatile organic compounds(VOCs) present in the groundwater have the potential to volatilize and migrate into the basement of these homes, particularly in the spring when the water table tends to be elevated and homes are still enclosed and heated. EPA had examined this issue via an air transport model and feels there is no risk from exposure to the migration of VOCs from groundwater. However, to allay any public concern regarding this issue, EPA conducted an air investigation of three homes in the Dewey Avenue area.

To evaluate whether there are VOCs volatilizing from groundwater and infiltrating residential basements, a two phase approach was implemented. Initially, a door to door survey of 17 homes along Dewey Avenue, 2 homes on Oregon Avenue and 1 home on Marietta Street were conducted on April 17 and 18, 1989 by EPA personnel. The home owners were given the opportunity to complete a survey questionnaire by April 21, 1989, at which time EPA and MA-DPH representatives selected three homes for an 8-hour indoor air sampling study. Sampling was conducted at REDACTED, REDACTED, and REDACTED on April 26, 27, and 28, 1989 respectively. In addition, one round of groundwater level measurements were performed on April 26, 1989 at up-gradient well S71S and down-gradient well S63S to document groundwater gradients in the residential area.

Unifirst and W.R. Grace voluntarily contracted with ENSR Consulting and Engineering to collect air samples concurrently with EPA at the homes in the Dewey Avenue area. The final results documented by EPA and ENSR will be compared and a technical evaluation of the two sampling methods will be performed at a later date.

1.2 Objective

The purpose of the initial survey was to obtain information from 17 homes along Dewey Avenue, 2 on Oregon Avenue, and 1 on Marietta Street by interviewing the home owner or distributing a questionnaire. The interview/questionnaire was designed to assess the integrity of the basement/foundation, whether water is or has been present in the basement, and to what extent the basement is used. This information was then utilized to select three homes for an 8-hour indoor air sampling study.

The purpose of the air sampling study was to collect sufficient quality data over an 8-hour period, for determining if selected volatile organic compounds (Table 2) associated with contaminated groundwater are volatilizing and infiltrating the residential basements. The information compiled in this report will be reviewed by EPA's Waste Management Division and ATSDR. A Health Consultation/Risk Assessment will then be performed by ATSDR/MA-DPH and EPA to determine if there are any risks from exposure to VOCs.

2.0 Residential Survey/Questionnaire

2.1 Description

On April 17 and 18, 1989, 17 homes along Dewey Avenue, 2 on Oregon Avenue, and 1 on Marietta Street were visited. If the owner was home, an attempt was made to conduct an interview using the questionnaire, as well as performing a visual inspection of the basement. If the owner was not at home, the questionnaire was left with a letter describing its purpose and required date of completion. Each survey was then evaluated by EPA and MA-DPH on April 21, 1989 and a decision made to select three homes for the air sampling study. Each home owner was then contacted to establish a convenient sampling date and time.

2.2 Survey/Questionnaire Results

The names of owners and addresses of homes included in the survey are listed on Table 1. The table also provides an indication on whether the questionnaire was completed and which basements were visually inspected. The location of each surveyed home, relative to the W.R. Grace and Unifirst properties, are displayed on Figure 1. A total of 20 homes were surveyed, of which, 14 questionnaires were completed and 6 either did not respond at all or expressed no interest in participating.

On April 21, 1989 14 completed questionnaires were reviewed by Peter Kahn of EPA and Eileen Furlong of MA-DPH. The 14 completed questionnaires are provided in Appendix A. The decision was made to select three homes that would effectively represent the study area. Therefore, REDACTED were selected for the 8-hour air sampling study.

3.0 Air Sampling Methodology

3.1 Description

EPA sampling and analytical methods, Method T01 - Method for the Determination of Volatile Organic Compounds in Ambient Air using Tenax Adsorption and Gas Chromatography/Mass Spectrometry (GC/MS) and Method T02 - Method for the Determination of Volatile Organic Compounds in Ambient Air by Carbon Molecular Sieve Adsorption and GC/MS, from the Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air, EPA-600/4-84-041, May 1987 were used to obtain air sampling data from the three homes. Environmental Services Division/Ambient Air and Emissions Monitoring Section and Chemistry Section personnel performed both the field sampling and analytical work.

Calibrated Dupont personal constant-flow air sampling pumps were used to collect eight hour samples on conditioned 1.5 grams of Tenax GC adsorbant, packed in 12.7mm OD x 10.0mm stainless steel tubes and on conditioned 0.4 grams Spherocarb adsorbant, packed in 6.35mm OD x 177.8mm stainless steel tubes which were inserted into stainless steel sampling cartridges. Certain nonpolar volatile organic compounds having boiling points in the range of approximately 80 to 200 degrees Fahrenheit were captured on Tenax GC (poly 2,6-Diphenyl phenylene oxide). Other more volatile compounds having boiling points ranging from -15 to +120 degrees Fahrenheit were collected on a carbon molecular sieve adsorbent, in this case, Spherocarb.

In addition, during the sampling event, other sources of VOCs, such as, paints, solvents, and fuel were identified if present.

3.2 Sampling Locations and Basement Descriptions

3.2.1 REDACTED

One sampling location was established in the basement of the home located at REDACTED in Woburn, Massachusetts. The basement is divided into three separate rooms as shown on Figure 2: a 14' x 9' bedroom, a 13'10" x 9' living area, both with a carpeted floor,

finished walls and ceiling, and electric baseboard heat. These two finished living areas are not currently being utilized. The third room is a 12' x 28' unfinished utility area is accessible from the two living areas through closing doors or from the outside through a bulkhead. The utility room has a poured concrete floor and occupied by: a washing machine, clothes dryer, electric and oil hot water tanks, oil fired furnace, oil tank, work bench, and shelving. Stored in this room are the following: laundry detergent, liquid Clorox 2, 1 quart of solvent cement for PVC (ingredients: Tetrahydrofuran, Cyclohexane, Methyl ethyl ketone, and Acetone), 1 gallon and 1 quart of polyurethane varnish, several gallon and quart cans of latex paint, 1 gallon Thin-X paint thinner, 1 quart spar urethane, 2 quarts wood stain, and 2 gallons antifreeze/coolant; all items are in well sealed containers.

There was no water present in the basement during the sampling period, in fact, the last time water was visibly present was 5 years ago. There are a few minor cracks on the walls in the utility room, a sump pit does exist in the bedroom, but is covered by a steel cover and carpet. Generally, there were no obvious areas by which gases could migrate up through the ground and infiltrate the basements air space. The amount of time spent in the basement's utility room, is approximately 5 hours per week to do laundry.

Samples were collected between 0830 and 1630 at 3.5' to 4.5' above floor level in the living area next to the stairs leading to the first floor. A Tenax and Sphero carb primary cartridge and secondary (backup) cartridge were connected in series, for calculating percent breakthrough. Additionally, a replicate and duplicate Tenax and Sphero carb sample were collected in parallel, at a different flow rate, to determine reproducibility and precision.

3.2.2 REDACTED

One sampling location was established in the basement of the home located at REDACTED in Woburn, Massachusetts. The basement is divided into three unfinished areas, as shown on Figure 3: a 10'8" x 20' open room with miscellaneous stored items, a 24'6" x 10'5" area with two work benches, washing machine, clothes dryer, hot water tank, and chest freezer, and the third room is a 20' x 13'6" area occupied by an oil hot air furnace, oil tank, a 2' x 2' x 2' sump pit, and shelving. The following items are stored on the shelves: 1 gallon Thin-X paint thinner, 10 gallons latex paint, 2 gallons polyurethane, several quarts of wood stain, several spray paint cans, car wax, antifreeze, gas treatment, brake fluid, and windshield washing fluid; all items are in well sealed containers.

The basement is constructed of a 4 foot poured concrete foundation with concrete block on top of the foundation and a poured concrete floor. There is no bulk head or walk-in entrance from the outside. Generally, the structural condition of the basement is good with some visible signs of floor cracks. There was no evidence of water present on the basement floor during the sampling period, except for 3 inches in the sump pit. According to the home owner, the only time water seepage becomes a problem is after several days of heavy rain. The owner seems to think that water is coming from the street and running down the driveway and seeping through the walls and floor. The only portion of the basement that gases could potentially migrate up through the ground and infiltrate the air space is from the sump pit. The amount of time spent in the basement is approximately 1 hour daily or 10 hours weekly to use the work shop or do laundry.

Samples were collected between the hours of 0845 and 1645 at 3.5' to 4.5' above floor level adjacent to the sump pit. A Tenax and Sphero carb primary cartridge and secondary(backup) cartridge were connected in series, for calculating percent breakthrough. Additionally, a replicate and duplicate Tenax and Sphero carb sample were collected in parallel, at a different flow rate, to determine reproducibility and precision.

3.2.3 REDACTED

One sampling location was established in the basement of the home located at REDACTED in Woburn, Massachusetts. The basement is divided into four separate areas, as shown on Figure 4: room 1 is a 10' x 10' vacant area with a 5' ceiling, room 2 is a 7'9" x 10' area with a 6' high ceiling used to store tools and parts, room 3 is a 7'6" x 9'11" area with a 7' ceiling occupied by a refrigerator, hot water tank, wood stove, and shelves. The following items are stored on the shelves: 2 gallons latex paint, muriatic acid, wood stain sealer, rust-oleum paint cans, acrylic enamel reducer(used as a paint thinner), and varnish; all items are in well sealed containers. These three rooms are unfinished, have poured concrete floors and concrete block walls; they are basically separate foundations interconnected by a rough opening in the block wall. Room 4 is approximately 22'6" x 11'4" area with a 6' high ceiling used as a living space. This room has finished walls, a carpeted floor, a washing machine, clothes dryer, wood stove, and storage under the stairs. An opening approximately 3' x 3' separates room 3 from room 4 which is usually closed by folding louver doors. The floor level of room 3 is approximately 4 feet lower than room 4.

There is no bulk head or walk-in entrance from the outside. Generally, the structural condition of the basement is good with some visible signs of floor and wall cracks in room 3. There was a little water present on the basement floor adjacent to the hot water tank in room 3, its origin could not be determined. Of the four areas or rooms associated with the basement, room 3 had the greatest potential for gases to migrate into the air space. The amount of time spent in the basement, particularly room 4, is approximately 2 to 3 hours per day.

Samples were collected between the hours of 0830 and 1630 at 3.5' to 4.5' above floor level in room 3. A Tenax and Sphero carb primary cartridge and secondary (backup) cartridge were connected in series, for calculating percent breakthrough. Additionally, a replicate and duplicate Tenax and Sphero carb sample were collected in parallel, at a different flow rate, to determine reproducibility and precision.

3.3 Quality Assurance/Quality Control

3.3.1 Pump Calibration

Prior to each sampling event, all sampling pumps were calibrated to their respective flow rates using a 500 ml bubble tube, flows were also checked after each sample run. The difference between the initial and final flow rates were all within the ± 15% acceptance criteria specified in the work plan.

3.3.2 Sample Storage and Transport

- ° For each sampling event, all Tenax and Sphero carb adsorbant traps were stored in their own individual containers during transport and laboratory storage. In addition, the traps were also placed in a glass jar containing charcoal to minimize cross contamination.
- ° All Tenax and Sphero carb adsorbant traps were stored at -20°C to 0°C in a clean laboratory freezer after pre-cleaning and after each sampling event, prior to analysis.

3.3.3 Sample Blanks

For each sampling event one clean Tenax and Sphero carb cartridge accompanied the samples to the field and back to the laboratory, without being used for sampling, to serve as trip blanks. The trip blank results for homes located at ^{REDACTED} are presented on Tables 4, 7, and 10 respectively. The data shows several compounds were either detected

at 5 nanograms or above on Spherocarb and Tenax traps. However, the amounts detected on the trip blanks were not greater than 25% of the sample amount, thereby meeting the acceptance criteria specified in the work plan. Therefore, no cross contamination occurred during transport.

One clean Tenax and Spherocarb trap were kept in the laboratory freezer to serve as laboratory blanks. There were no amounts detected above 5 nanograms on either trap, indicating no cross contamination occurred during storage. This data is normally not reported unless contaminants are detected.

3.3.4 Breakthrough Determination

3.3.4.1 REDACTED

A set of Tenax and Spherocarb primary and secondary(backup) samples were collected to determine if any compounds migrated through the primary trap into the secondary during sampling. The results presented on Table 3 show some breakthrough occurred with compounds: Carbon Tetrachloride, Benzene, Tetrachloroethylene, Ethylbenzene, 1,3,5-Trimethylbenzene, 1,2,4-Trimethylbenzene, Napthalene, Trichlorofluoromethane, and Methylene Chloride. These compounds were detected on the secondary traps at levels greater than 20% of the levels detected on the primary trap, thereby not exactly meeting the acceptance criteria specified in the work plan. However, given the low concentrations detected both on the primary and secondary traps, and given the excellent reproducibility and precision data, the breakthrough data should not be considered as a significant problem. Therefore, the data reported for the Tenax and Spherocarb primary traps are valid and are considered to be representative.

3.3.4.2 REDACTED

A set of Tenax and Spherocarb primary and secondary(backup) samples were collected to determine if any compounds migrated through the primary trap into the secondary during sampling. The results presented on Table 6 show the secondary Tenax trap contained less than 20% of the amount of components of interest found on the primary trap, thereby meeting the acceptance criteria specified in the work plan. However, the secondary Spherocarb trap data showed breakthrough had occurred with Carbon Disulfide. Therefore, Carbon Disulfide data reported for the primary trap only represents an estimated concentration. Bromomethane was detected at less than 0.24 ppb on the secondary trap and nondetectable on the primary, replicate and duplicate traps. This does not necessarily mean that breakthrough occurred, but is an indication that contamination could of been the potential problem. Therefore, data reported for Bromomethane on the secondary trap is of questionable quality.

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3.3.4.3 REDACTED

A set of Tenax and Spherocarb primary and secondary(backup) samples were collected to determine if any compounds migrated through the primary trap into the secondary during sampling. The results presented on Table 9 show no significant breakthrough occurred on the secondary Tenax and Spherocarb traps, thereby meeting the acceptance criteria specified in the work plan.

3.3.5 Reproducibility

3.3.5.1 REDACTED

One set of Tenax and Spherocarb parallel samples(two samples simultaneously collected) were collected at a different flow rate than the primary-secondary sampling train, to assess reproducibility. In addition, one set of duplicate Tenax and Spherocarb samples were collected in parallel at the same flow rate as the replicate samples, to assess precision. The results presented on Table 3 show excellent agreement between primary-secondary, replicate and duplicate data, meeting the acceptance criteria presented in the work plan.

3.3.5.2 REDACTED

One set of Tenax and Spherocarb parallel samples(two samples simultaneously collected) were collected at a different flow rate than the primary-secondary sampling train, to assess reproducibility. In addition, one set of duplicate Tenax and Spherocarb samples were collected in parallel at the same flow rate as the replicate samples, to assess precision.

The data presented on Table 6 for the compounds detected on Tenax show excellent reproducibility. The precision data was generally within $\pm 25\%$, except for compounds: 1,1,1-Trichloroethane, Toluene, 1,3,5-Trimethylbenzene, and 1,2,4-Trimethylbenzene which had differences of 34%, 30%, 33%, and 30% respectively between replicate and duplicate samples. Precision data of 30 to 34 percent is not that significant, and should not be indicative of poor quality data.

The precision and reproducibility data presented for compounds detected on Spherocarb were acceptable, except Trichlorofluoromethane, 1,1-Dichloroethylene, and Methylene Chloride. Trichlorofluoromethane data showed acceptable precision(20%) but unacceptable reproducibility(47%); 1,1-Dichloroethylene had both unacceptable reproducibility(-111%) and precision(-111%) data; Methylene Chloride data showed excellent reproducibility(0%) and poor precision (57%). Therefore, the data reported for Trichlorofluoromethane, 1,1-Dichloroethylene, and Methylene Chloride only represent estimated values.

3.3.5.3 REDACTED

One set of Tenax and Spherocarb parallel samples (two samples simultaneously collected) were collected at a different flow rate than the primary-secondary sampling train, to assess reproducibility. In addition, one set of duplicate Tenax and Spherocarb samples were collected in parallel at the same flow rate as the replicate samples, to assess precision.

The data presented on Table 9 for the compounds detected on Tenax showed excellent precision. Reproducibility data was generally within $\pm 25\%$, except for Toluene and Total Xylenes, which had differences between primary and replicate samples of 34% and 40% respectively. Reproducibility of 34% and 40% is not that significant given precision data of 0% for Toluene and 5% for Total Xylenes. In addition, twice the sample was collected on the primary trap (12 liters) relative to the replicate (6 liters), indicating why approximately 1.5 times less of a concentration was detected on the replicate. Therefore, the Toluene and Total Xylenes reproducibility data does not significantly degrade data quality for these two compounds.

The precision and reproducibility data presented for compounds detected on Spherocarb were all within the $\pm 25\%$ acceptable range, except for Acetone. Acetone concentrations were 13 ppb on the primary trap, 9.4 ppb on the replicate, and 13 ppb on the duplicate, indicating precision and reproducibility to be -32% and +32% respectively. However, comparing the primary (13 ppb) to the duplicate (13 ppb) excellent agreement becomes evident. Therefore, a reported value of 13 ppb for Acetone would be considered conservative but representative.

3.3.6 Chain of Custody

Chain of Custody documentation was completed by the field engineer. Samples were only handled by the field engineer and the chemist performing the analysis.

4.0 Analytical Methodology

Analytical methods TO-1 and TO-2 from the Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air, EPA - 600/4-84-041, May 1987 were used to analyze samples collected on April 25, 26 and 27, 1989. The following instrumentation and procedures were utilized:

4.1 Instrumentation

- HP 5970 Mass Selective Detector
- HP 5890 Gas Chromatograph equipped with a 60 meter VOCOL capillary column
- HP 1000 computer using the RTE and Aquarius software
- Tekmar 5000 Thermal Desorber

4.2 Standard Preparation for Quantitation

A pure standard mixture of selected compounds was purchased from Supelco, a serial dilution of the mixture was prepared in methanol at the EPA laboratory. A known volume of the standard was then injected onto each Tenax and Sphero carb trap using the flash vaporization technique. The sample cartridge was then thermally desorbed and the sample analyzed on the GC/MS.

4.3 Analytical Method

Sampled traps were desorbed at 250°C for 8 minutes and condensed on a cryogenic trap maintained at -100°C by liquid nitrogen. The sample was then desorbed to the VOCOL column held at 10°C. Identification was based on the unknown's mass spectra and retention times. Quantification was accomplished using an external multipoint calibration for the compounds of interest. Other compounds were tentatively identified based on the computer's library search.

4.3.1 Tekmar Desorber Operating Conditions

	<u>Tenax</u>	<u>Sphero carb</u>
Line Heater:	260°C	260°C
Valve Heater:	270°C	270°C
Injector Heater:	260°C	260°C
Ready:	40°C	45°C
Purge 1:	5 min.	10 min.@250ml/min
Cryogenic 1:	-100°C	-130°C
Purge 2:	0 min.	0 min.
Desorb:	230°C	380°C
Desorb Time:	8 min.	10 min.
Cryogenic 2 cool 2:	35°C	35°C
Cryogenic 1 Trans.:	250°C	250°C
Trans. Time:	3 min.	3 min.
Cryogenic 2 Inject:	40°C	40°C
Inject:	0.05 min.	0.05 min.
Bake:	250°C	390°C
Time:	5 min.	4 min.

	<u>Tenax</u>	<u>Spherocarb</u>
Purge Flow:	20 ml/min.	250 ml/min.
Desorb Flow:	20 ml/min.	25 ml/min.
Desorb Pressure:	30 psi	40 psi

4.3.2 GC Operating Conditions

	<u>Tenax</u>	<u>Spherocarb</u>
Initial Temp.:	0°C	-30°C
Initial Time:	2 min.	2 min.
Rate:	6 °C/min.	8 °C/min.
Temp. 2:	100°C	80°C
Rate:	12 min.	30 min.
Final Temp.	200°C	170°C

4.3.3 MS Operating Conditions

	<u>Tenax</u>	<u>Spherocarb</u>
Scan:	35 to 300 daltons	35 to 300 daltons
Scan Rate:	3	3
Scan Start:	5 min.	2 min.

4.4 Quality Control

4.4.1 Cartridge Conditioning

Tenax and Spherocarb traps were thermally conditioned in a Tekmar Model 5100 Thermal Conditioner on April 20 and 21, 1989. Tenax traps were conditioned for 14 hours at 270°C with a nitrogen purge rate of approximately 100 ml/min. Spherocarb cartridges were conditioned for 14 hours at 399°C with a nitrogen purge rate of approximately 100 ml/min.

4.4.2 Surrogate Spiked Cartridges

After the Tenax traps were conditioned, on April 24, 1989, each trap was injected with 5 microliters of a surrogate solution, composed of duterated Benzene (d6), Toluene(d8), and p-Bromofluorobenzene in methanol, using the flash vaporization technique. The traps were then placed in proper storage prior to field sampling activities. Percent recoveries for the surrogate compounds were all excellent, ranging from 50% to 142% for the REDACTED study, 71% to 117% for REDACTED, and 80% to 162% for REDACTED.

5.0 Groundwater Level Determination

The Environmental Services Division, Environmental Studies Section performed one round of water level measurements at up-gradient well S71S and down-gradient well S63S on April 26, 1989. The location of the wells are presented on Figure 1. A plunker/weight attached to a surveyor's tape was used to obtain the measurements.

The water level in wells S71S and S63S were 9.65 feet and 10.94 feet below ground level, respectively. Considering the average basement floor is approximately 6 feet below grade, the ground water table can then be estimated to have been between 4.95 to 3.65 feet below the basement floor of homes in the Dewey Avenue area during sampling.

6.0 Indoor Meteorological Measurements

During the eight hour sampling period, in each basement, eight temperature, barometric pressure, and relative humidity measurements were documented. Temperature readings were obtained with a Ertco thermometer, atmospheric pressure with a Taylor aneroid barometer, and relative humidity with a Bacharach Instrument sling psychrometer.

Meteorological data recorded in the basement located at REDACTED on April 25, 1989 are presented on Table 5. The average measured values during the sampling period were as follows: temperature 57°F, barometric pressure 758.44 mm Hg, and relative humidity 31%.

Meteorological data recorded in the basement at REDACTED on April 26, 1989 are presented on Table 8. The average measurements during the sampling period were as follows: temperature 63°F, barometric pressure 758.95 mm Hg, and relative humidity 44%.

Meteorological data recorded in the basement at REDACTED on April 27, 1989 are presented on Table 11. The average measured values during the sampling period were as follows: temperature 52°F, barometric pressure 758.70 mm Hg, and relative humidity 50%.

7.0 Sampling Results and Discussions

7.1 REDACTED Results and Discussion

Data collected in the basement are presented on Table 3 and summarized on Table 12. Generally, the data collected on April 25, 1989 are considered to be of sufficient quality to adequately represent the levels individuals would have been exposed to, if present in the basement, during the entire sampling period. The compounds detected above their lower limits of detection, with their maximum concentration in parenthesis, are as follows: 1,1,1-Trichloroethane (5.5 ppb), Carbon Tetrachloride (0.2 ppb), Benzene (<0.7 ppb), Trichloroethylene (<0.2 ppb), Methyl Isobutyl Ketone (<0.2 ppb), Toluene (2.0 ppb), Tetrachloroethylene (0.4 ppb), Ethylbenzene (0.3 ppb), Total Xylenes (1.1 ppb), 1,3,5-Trimethylbenzene (0.4 ppb), 1,2,4-Trimethylbenzene (0.3 ppb), 1,4-Dichlorobenzene (1.6 ppb), Napthalene (0.3 ppb), Trichlorofluoromethane (2.8 ppb), 1,1-Dichloroethylene (1.4 ppb), and Methylene Chloride (2.8 ppb).

Of the five target compounds detected in groundwater, 1,1,1-Trichloroethane, Trichloroethylene, and Tetrachloroethylene were identified to be present in the basement air at low ppb levels. In comparison, (previous indoor air studies conducted by this office have shown similar concentrations. In general, maximum concentrations for all compounds were below 5 ppb, indicating levels to be slightly lower than what have been typically detected indoors. Therefore, the compounds identified in this study are probably not directly associated with contaminants present in the groundwater, but rather from common sources found in the household, such as the products identified in Section 3.2.1.

7.2 REDACTED Results and Discussion

Table 6 presents the data obtained from the basement on April 26, 1989. Table 13 summarizes the data by listing those compounds identified above their lower limits of detection. Generally, the data are considered to be of sufficient quality to adequately represent the levels individuals would have been exposed to, if present in the basement, during the entire sampling period. However, the data presented for Carbon Disulfide and Bromomethane did not meet the breakthrough acceptance criteria. Therefore, the reported concentrations for Carbon Disulfide and Bromomethane can only be estimated to have been approximately 0.2 ppb and less than 0.2 ppb respectively. Also, the data for Trichlorofluoromethane, 1,1-Dichloroethylene, Methylene Chloride, and Chloroethane did not meet the acceptance criteria for reproducibility or precision. Therefore, the reported concentrations for Trichlorofluoromethane, 1,1-Dichloroethylene, Methylene Chloride, and Chloroethane can only be estimated to have been approximately between 3.0 to 6.0 ppb, 1.0 to 3.5 ppb, 16 to 29 ppb, and 0.8 ppb, respectively.

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Of the five selected compounds detected in groundwater, 1,1,1-Tri chloroethane, and Tetrachloroethylene were identified to be present in the basement air at low ppb levels. In comparison, previous indoor air studies conducted by this office have shown similar concentrations. In general, maximum concentrations for all compounds were well below 5 ppb, indicating slightly lower levels than typical indoor air values. However, Acetone was detected at a slightly higher concentration of 13 ppb. Therefore, the compounds identified in this study are probably not directly associated with contaminants present in the groundwater, but rather from common sources found in the household, such as the products identified in Section 3.2.3.

8.0 Conclusions

Air data obtained from residential basements located at REDACTED REDACTED, are considered of adequate quality to assess if selected volatile organic compounds (Table 2), associated with contaminated groundwater, volatilized and infiltrated the basements air space during the sampling event. Three of the five selected compounds, namely: 1,1,1-Trichloroethane, Trichloroethylene, and Tetrachloroethylene were detected in each basement. Trichloroethylene and Tetrachloroethylene concentrations in the three basements were essentially the same, ranging from nondetectable to less than 2 ppb and 0.4 ppb to 0.9 ppb, respectively. However, 1,1,1-Trichloroethane was detected at 25 ppb in the REDACTED REDACTED basement. compared to 5.5 ppb and 2.8 ppb at REDACTED and REDACTED, respectively. The majority of detected nontarget compounds were found to have concentrations slightly higher in the REDACTED basement than in the other two basements. The REDACTED basement was determined to have, of the three, the greatest potential for gases to migrate up into the basement, particularly up through the open sump pit. In addition, more household products containing a variety of these compounds were stored in the REDACTED basement. In general, data obtained from this study showed similar concentrations compared to previous indoor air studies conducted by this office. Therefore, identifying the contaminated groundwater as the only source contributing to air concentrations in the basements, can not be made with any certainty. A trained toxicologist should review this report thoroughly to determine the potential health effects to occupants of these homes.

TABLE 1

RESIDENTIAL SURVEY QUESTIONNAIRE SUMMARY

<u>Street/Avenue</u>	<u>Number</u>	<u>Resident</u>	<u>Questionnaire Completed</u>	<u>Visually Inspected</u>
Dewey Avenue	REDACTED		YES	YES
			NO	NO
			YES	YES
			NO	NO
			YES	YES
			NO	NO
			YES	NO
			NO	NO
			YES	YES
			NO	NO
			YES	YES
			YES	YES
			YES	YES
			YES	NO
			YES	YES
			YES	NO
			NO	NO
Marietta St.			YES	YES
Oregon Avenue			YES	NO
			YES	NO

TABLE 2 - COMPOUNDS OF INTEREST

Compounds detected using Tenax:

1,1,1-Trichloroethane

Trichloroethylene

Tetrachloroethylene

Compounds detected using Spherocarb:

Vinyl Chloride

trans-1,2-Dichloroethylene

SITE LOCATION	SAMPLE	SAMPLE VOL. (liters)	ADSORBENT	COMPOUND	CONCENTRATION		DETECTION LEVEL (ug/m ³)
					(ug/m ³)	(ppb, v/v)	
Basement	1 prim.	12	Spherocarb	Vinyl Chloride	ND	ND	0.4
				Bromomethane	ND	ND	
				Chloroethane	ND	ND	
				Trichlorofluoromethane	11	2	
				1,1-Dichloroethylene	3.7	0.9	
				Methylene Chloride	7.9	2.3	
				<u>t-1,2-Dichloroethylene</u>	ND	ND	
				<u>1,1-Dichloroethane</u>	ND	ND	
				Chloroform	ND	ND	
				Methyl ethyl ketone	ND	ND	
				Bromochloromethane	ND	ND	
				Acetone	ND	ND	
				Carbon Disulfide	ND	ND	
				c-1,2-Dichloroethylene	ND	ND	
				Trichlorotrifluoroethane	ND	ND	
				Hydrocarbon, C6	†	†	
				Hydrocarbon, C5	†	†	
				Tetrahydrofuran	†	†	
Basement	2 sec.	12	Spherocarb	Vinyl Chloride	ND	ND	0.4
				Bromomethane	ND	ND	
				Chloroethane	ND	ND	
				Trichlorofluoromethane	2.7	0.5	
				1,1-Dichloroethylene	0.6	0.2	
				Methylene Chloride	<2.4	<0.7*	
				<u>t-1,2-Dichloroethylene</u>	ND	ND	
				<u>1,1-Dichloroethane</u>	ND	ND	
				Chloroform	ND	ND	
				Methyl ethyl ketone	ND	ND	
				Bromochloromethane	ND	ND	
				Acetone	ND	ND	
				Carbon Disulfide	ND	ND	
				c-1,2-Dichloroethylene	ND	ND	
				Trichlorotrifluoroethane	ND	ND	
				Acetaldehyde	†	†	
				Hydrocarbon, C6	†	†	
				Butenal	†	†	
				Tetrahydrofuran	†	†	

Notes:

ND = none detected

† = Tentatively Identified

prim. = primary tube

sec. = secondary tube

Compounds underlined are the compounds that have been detected in groundwater

< = less than

* = Compound detected on lab blank at a level less than 5 nanograms.

SITE LOCATION	SAMPLE	SAMPLE VOL. (liters)	ADSORBENT	COMPOUND	CONCENTRATION		DETECTION LEVEL (ug/m ³)
					(ug/m ³)	(ppb, v/v)	
Basement	4 rep.	6	Spherocarb	<u>Vinyl Chloride</u>	ND	ND	0.8
				Bromomethane	ND	ND	
				Chloroethane	ND	ND	
				Trichlorofluoromethane	16	2.8	
				1,1-Dichloroethylene	5.6	1.4	
				Methylene Chloride	8.6	2.5	
				<u>t-1,2-Dichloroethylene</u>	ND	ND	
				<u>1,1-Dichloroethane</u>	ND	ND	
				Chloroform	ND	ND	
				Methyl ethyl ketone	ND	ND	
				Bromochloromethane	ND	ND	
				Acetone	ND	ND	
				Carbon Disulfide	ND	ND	
				c-1,2-Dichloroethylene	ND	ND	
				Trichlorotrifluoroethane	ND	ND	
				Hydrocarbon, C6 isomers	†	†	
				Hydrocarbon, C5	†	†	
				Tetrahydrofuran	†	†	

Notes:

ND = none detected

† = Tentatively Identified

rep. = replicate tube

Compounds underlined are the compounds that have been detected in groundwater

SITE LOCATION	SAMPLE	SAMPLE VOL. (liters)	ADSORBENT	COMPOUND	CONCENTRATION		DETECTION LEVEL (ug/m ³)
					(ug/m ³)	(ppb, v/v)	
Basement	5 dup.	6	Spherocarb	<u>Vinyl Chloride</u>	ND	ND	0.8
				Bromomethane	ND	ND	
				Chloroethane	ND	ND	
				Trichlorofluoromethane	12	2.2	
				1,1-Dichloroethylene	3.4	0.9	
				Methylene Chloride	9.9	2.8	
				<u>t-1,2-Dichloroethylene</u>	ND	ND	
				<u>1,1-Dichloroethane</u>	ND	ND	
				Chloroform	ND	ND	
				Methyl ethyl ketone	ND	ND	
				Bromchloromethane	ND	ND	
				Acetone	ND	ND	
				Carbon Disulfide	ND	ND	
				c-1,2-Dichloroethylene	ND	ND	
				Trichlorotrifluoroethane	ND	ND	
				Hydrocarbon, C6	†	†	
				C-4 Ketone	†	†	
				Tetrahydrofuran	†	†	

Notes:

ND = none detected

† = Tentatively Identified

dup. = duplicate tube

Compounds underlined are the compounds that have been detected in groundwater

SITE LOCATION	SAMPLE	SAMPLE VOL. (liters)	ADSORBENT	COMPOUND	CONCENTRATION		DETECTION LEVEL (ug/m ³)
					(ug/m ³)	(ppb, v/v)	
Basement	1 prim.	12	Tenax	<u>1,1,1-Trichloroethane</u>	27	4.9	0.4
				Carbon Tetrachloride	1.0	0.2	
				Benzene	1.5	0.5	
				1,2-Dichloroethane	ND	ND	
				<u>Trichloroethylene</u>	<0.4	<0.1	
				1,2-Dichloropropane	ND	ND	
				Bromodichloromethane	ND	ND	
				2-Chloroethylvinyl ether	ND	ND	
				cis-1,3-dichloropropene	ND	ND	
				Methyl Isobutyl Ketone	ND	ND	
				Dibromomethane	ND	ND	
				Toluene	6.5	1.7	
				trans-1,3-Dichloropropene	ND	ND	
				1,1,2-Trichloroethane	ND	ND	
				<u>Tetrachloroethylene</u>	2.2	0.3	
				1,3-Dichloropropane	ND	ND	
				Dibromochloromethane	ND	ND	
				1,2-Dibromoethane	ND	ND	
				Chlorobenzene	ND	ND	
				Ethylbenzene	0.9	0.2	
				Bromoform	ND	ND	
				1,2-Dichlorobenzene	ND	ND	
				Xylenes (total)	3.9	0.9	
				Styrene	ND	ND	
				Isopropylbenzene	ND	ND	
				1,1,2,2-Tetrachloroethane	ND	ND	
				Bromobenzene	ND	ND	
				1,2,3-Trichloropropane	ND	ND	
				n-Propylbenzene	ND	ND	
				2-Chlorotoluene	ND	ND	
				1,3,5-Trimethylbenzene	1.5	0.3	
				4-Chlorotoluene	ND	ND	
				t-Butylbenzene	ND	ND	
				1,2,4-Trimethylbenzene	1.2	0.2	
				s-Butylbenzene	ND	ND	
				p-Isopropyltoluene	ND	ND	
				1,3-Dichlorobenzene	ND	ND	
				1,4-Dichlorobenzene	7.3	1.2	
				n-Butylbenzene	ND	ND	
				1,2-Dibromo-3-chloropropane	ND	ND	
				1,2,4-Trichlorobenzene	ND	ND	
				Hexachlorobutadiene	ND	ND	
				Naphthalene	0.8	0.2	
				<u>1,2,3-Trichlorobenzene</u>	ND	ND	

Compounds Tentatively Identified: Hydrocarbon-C7, Hydrocarbon-C8 isomers, Hydrocarbon-C10,
Hydrocarbon-C13 isomers

Notes: ND = none detected
prim. = primary tube
< = less than

Compounds underlined are the compounds that have been detected in groundwater

SITE LOCATION	SAMPLE	SAMPLE VOL. (liters)	ADSORBENT	COMPOUND	CONCENTRATION		DETECTION LEVEL (ug/m ³)
					(ug/m ³)	(ppb, v/v)	
Basement	2 sec.	12	Tenax	<u>1,1,1-Trichloroethane</u>	2.7	0.5	0.4
				Carbon Tetrachloride	<0.4	<0.1	
				Benzene	<1.2	<0.4*	
				1,2-Dichloroethane	ND	ND	
				<u>Trichloroethylene</u>	ND	ND	
				1,2-Dichloropropane	ND	ND	
				Bromodichloromethane	ND	ND	
				2-Chloroethylvinyl ether	ND	ND	
				cis-1,3-dichloropropene	ND	ND	
				Methyl Isobutyl Ketone	ND	ND	
				Dibromomethane	ND	ND	
				Toluene	0.8	0.2	
				trans-1,3-Dichloropropene	ND	ND	
				1,1,2-Trichloroethane	ND	ND	
				<u>Tetrachloroethylene</u>	<0.4	<0.1	
				1,3-Dichloropropane	ND	ND	
				Dibromochloromethane	ND	ND	
				1,2-Dibromoethane	ND	ND	
				Chlorobenzene	ND	ND	
				Ethylbenzene	<0.4	<0.1	
				Bromoform	ND	ND	
				1,2-Dichlorobenzene	ND	ND	
				Xylenes (total)	0.6	0.1	
				Styrene	ND	ND	
				Isopropylbenzene	ND	ND	
				1,1,2,2-Tetrachloroethane	ND	ND	
				Bromobenzene	ND	ND	
				1,2,3-Trichloropropane	ND	ND	
				n-Propylbenzene	ND	ND	
				2-Chlorotoluene	ND	ND	
				1,3,5-Trimethylbenzene	<0.4	<0.1	
				4-Chlorotoluene	ND	ND	
				t-Butylbenzene	ND	ND	
				1,2,4-Trimethylbenzene	<0.4	<0.1	
				s-Butylbenzene	ND	ND	
				p-Isopropyltoluene	ND	ND	
				1,3-Dichlorobenzene	ND	ND	
				1,4-Dichlorobenzene	1.2	0.2	
				n-Butylbenzene	ND	ND	
				1,2-Dibromo-3-chloropropane	ND	ND	
				1,2,4-Trichlorobenzene	ND	ND	
				Hexachlorobutadiene	ND	ND	
				Naphthalene	<0.4	<0.1	
				1,2,3-Trichlorobenzene	ND	ND	

Compounds Tentatively Identified: Hydrocarbon-C6, Hydrocarbon-Cl2, Oxidane C2 substituted, Benzaldehyde

Notes: ND = none detected

sec. = secondary tube

< = less than

Compounds underlined are the compounds that have been detected in groundwater

* = Compound detected on lab blank at a level less than 5 nanograms.

SITE LOCATION	SAMPLE	SAMPLE VOL. (liters)	ADSORBENT	COMPOUND	CONCENTRATION		DETECTION LEVEL (ug/m ³)
					(ug/m ³)	(ppb, v/v)	
Basement	5 rep.	6	Tenax	<u>1,1,1-Trichloroethane</u>	25	4.6	0.8
				<u>Carbon Tetrachloride</u>	1.2	0.2	
				Benzene	<2.3	<0.7*	
				<u>1,2-Dichloroethane</u>	ND	ND	
				<u>Trichloroethylene</u>	<0.8	<0.2	
				<u>1,2-Dichloropropane</u>	ND	ND	
				Bromodichloromethane	ND	ND	
				2-Chloroethylvinyl ether	ND	ND	
				cis-1,3-dichloropropene	ND	ND	
				Methyl Isobutyl Ketone	<0.8	<0.2	
				Dibromomethane	ND	ND	
				Toluene	5.7	1.5	
				trans-1,3-Dichloropropene	ND	ND	
				<u>1,1,2-Trichloroethane</u>	ND	ND	
				<u>Tetrachloroethylene</u>	2.0	0.3	
				<u>1,3-Dichloropropane</u>	ND	ND	
				Dibromochloromethane	ND	ND	
				<u>1,2-Dibromoethane</u>	ND	ND	
				Chlorobenzene	ND	ND	
				Ethylbenzene	<0.8	<0.2	
				Bromoform	ND	ND	
				<u>1,2-Dichlorobenzene</u>	ND	ND	
				Xylenes (total)	3.8	0.9	
				Styrene	ND	ND	
				Isopropylbenzene	ND	ND	
				<u>1,1,2,2-Tetrachloroethane</u>	ND	ND	
				Bromobenzene	ND	ND	
				<u>1,2,3-Trichloropropane</u>	ND	ND	
				n-Propylbenzene	ND	ND	
				2-Chlorotoluene	ND	ND	
				<u>1,3,5-Trimethylbenzene</u>	1.8	0.4	
				4-Chlorotoluene	ND	ND	
				t-Butylbenzene	ND	ND	
				<u>1,2,4-Trimethylbenzene</u>	1.2	0.2	
				s-Butylbenzene	ND	ND	
				p-Isopropyltoluene	ND	ND	
				<u>1,3-Dichlorobenzene</u>	ND	ND	
				<u>1,4-Dichlorobenzene</u>	7.1	1.2	
				n-Butylbenzene	ND	ND	
				<u>1,2-Dibromo-3-chloropropane</u>	ND	ND	
				<u>1,2,4-Trichlorobenzene</u>	ND	ND	
				Hexachlorobutadiene	ND	ND	
				Naphthalene	<0.8	<0.2	
				<u>1,2,3-Trichlorobenzene</u>	ND	ND	

Compounds Tentatively Identified: Hydrocarbon-C5, Hydrocarbon-C6 isomers, Hydrocarbon-C8, Hydrocarbon-C9, Hydrocarbon-C10 isomers, Hydrocarbon-C11, Hydrocarbon-C12, Hydrocarbon-C13, Methyl ethyl ketone Tetrahydrofuran, Benzene-C3 substituted, Pyrazole dihydrodimethyl, cyclohexane dimethyl

Notes: ND = none detected

rep. = replicate tube

< = less than

* = Compound detected on lab blank at a level less than 5 nanograms.

Compounds underlined are the compounds that have been detected in groundwater

SITE LOCATION	SAMPLE	SAMPLE VOL. (liters)	ADSORBENT	COMPOUND	CONCENTRATION		DETECTION LEVEL (ug/m ³)
					(ug/m ³)	(ppb, v/v)	
Basement	4 dup.	6	Tenax	<u>1,1,1-Trichloroethane</u>	30	5.5	0.8
				Carbon Tetrachloride	1.4	0.2	
				Benzene	<2.3	<0.7*	
				1,2-Dichloroethane	ND	ND	
				<u>Trichloroethylene</u>	<0.8	<0.2	
				1,2-Dichloropropane	ND	ND	
				Bromodichloromethane	ND	ND	
				2-Chloroethylvinyl ether	ND	ND	
				cis-1,3-dichloropropene	ND	ND	
				Methyl Isobutyl Ketone	<0.8	<0.2	
				Dibromomethane	ND	ND	
				Toluene	7.6	2	
				trans1,3-Dichloropropene	ND	ND	
				1,1,2-Trichloroethane	ND	ND	
				<u>Tetrachloroethylene</u>	2.6	0.4	
				1,3-Dichloropropane	ND	ND	
				Dibromochloromethane	ND	ND	
				1,2-Dibromoethane	ND	ND	
				Chlorobenzene	ND	ND	
				Ethylbenzene	1.2	0.3	
				Bromoform	ND	ND	
				1,2-Dichlorobenzene	ND	ND	
				Xylenes (total)	4.8	1.1	
				Styrene	ND	ND	
				Isopropylbenzene	ND	ND	
				1,1,2,2Tetrachloroethane	ND	ND	
				Bromobenzene	ND	ND	
				1,2,3-Trichloropropane	ND	ND	
				n-Propylbenzene	ND	ND	
				2-Chlorotoluene	ND	ND	
				1,3,5-Trimethylbenzene	1.8	0.4	
				4-Chlorotoluene	ND	ND	
				t-Butylbenzene	ND	ND	
				1,2,4-Trimethylbenzene	1.6	0.3	
				s-Butylbenzene	ND	ND	
				p-Isopropyltoluene	ND	ND	
				1,3-Dichlorobenzene	ND	ND	
				1,4-Dichlorobenzene	9.6	1.6	
				n-Butylbenzene	ND	ND	
				1,2Dibromo3chloropropane	ND	ND	
				1,2,4-Trichlorobenzene	ND	ND	
				Hexachlorobutadiene	ND	ND	
				Naphthalene	1.4	0.3	
				1,2,3-Trichlorobenzene	ND	ND	

Compounds Tentatively Identified: Hydrocarbon-C6, Hydrocarbon-C7 isomers, Hydrocarbon-C8, Hydrocarbon-C9 isomers, Hydrocarbon-C10 isomers, Hydrocarbon-C11 isomers, Hydrocarbon-C13 isomers

Notes: ND = none detected

dup. = duplicate tube

< = less than

* = Compound detected on lab blank at a level less than 5 nanograms.

Compounds underlined are the compounds that have been detected in groundwater

SITE LOCATION	SAMPLE	SAMPLE VOL. (liters)	ADSORBENT	COMPOUND	AMOUNT (ng)	CONCENTRATION (ppb, v/v)	DETECTION LEVEL (ng)
Trip Blank	7	NA	Spherocarb	Vinyl Chloride	ND	NA	5
				Bromomethane	<11*	NA	
				Chloroethane	ND	NA	
				Trichlorofluoromethane	ND	NA	
				1,1-Dichloroethylene	ND	NA	
				Methylene Chloride	<29*	NA	
				<u>t-1,2-Dichloroethylene</u>	ND	NA	
				<u>1,1-Dichloroethane</u>	ND	NA	
				Chloroform	ND	NA	
				Methyl ethyl ketone	ND	NA	
				Bromchloromethane	ND	NA	
				Acetone	ND	NA	
				Carbon Disulfide	ND	NA	
				c-1,2-Dichloroethylene	ND	NA	
				Trichlorotrifluoroethane	ND	NA	

Notes:

ND = none detected

NA = not applicable

Compounds underlined are the compounds that have been detected in groundwater

< = less than

* = Compound detected on lab blank at a level less than 5 nanograms.

SITE LOCATION	SAMPLE	SAMPLE VOL. (liters)	ADSORBENT	COMPOUND	AMOUNT (ng)	CONCENTRATION (ppb, v/v)	DETECTIO LEVEL (ng)
Trip Blank	3	NA	Tenax	1,1,1-Trichloroethane	ND	NA	5
				Carbon Tetrachloride	ND	NA	
				Benzene	<14*	NA	
				1,2-Dichloroethane	ND	NA	
				Trichloroethylene	ND	ND	
				1,2-Dichloropropane	ND	NA	
				Bromodichloromethane	ND	NA	
				2-Chloroethylvinyl ether	ND	NA	
				cis-1,3-dichloropropene	ND	NA	
				Methyl Isobutyl Ketone	ND	NA	
				Dibromomethane	ND	NA	
				Toluene	<5 *	NA	
				trans 1,3-Dichloropropene	ND	NA	
				1,1,2-Trichloroethane	ND	NA	
				Tetrachloroethylene	<5	NA	
				1,3-Dichloropropane	ND	NA	
				Dibromochloromethane	ND	NA	
				1,2-Dibromoethane	ND	NA	
				Chlorobenzene	ND	NA	
				Ethylbenzene	<5	NA	
				Bromoform	<5	NA	
				1,2-Dichlorobenzene	ND	NA	
				Xylenes (total)	ND	NA	
				Styrene	ND	NA	
				Isopropylbenzene	ND	NA	
				1,1,2,2-Tetrachloroethane	ND	NA	
				Bromobenzene	ND	NA	
				1,2,3-Trichloropropane	ND	NA	
				n-Propylbenzene	ND	NA	
				2-Chlorotoluene	ND	NA	
				1,3,5-Trimethylbenzene	ND	NA	
				4-Chlorotoluene	ND	NA	
				t-Butylbenzene	ND	NA	
				1,2,4-Trimethylbenzene	ND	NA	
				s-Butylbenzene	ND	NA	
				p-Isopropyltoluene	ND	NA	
				1,3-Dichlorobenzene	ND	NA	
				1,4-Dichlorobenzene	ND	NA	
				n-Butylbenzene	ND	NA	
				1,2Dibromo3chloropropane	ND	NA	
				1,2,4-Trichlorobenzene	ND	NA	
				Hexachlorobutadiene	ND	NA	
				Naphthalene	ND	NA	
				1,2,3-Trichlorobenzene	ND	NA	

Compounds Tentatively Identified: Hydrocarbon-C6

Notes: ND = none detected

NA = not applicable

Compounds underlined are the compounds that have been detected in groundwater

* = Compound detected on lab blank at a level less than 5 nanograms.

< = less than

TABLE 5

APRIL 25, 1989 REDACTED

BASEMENT METEOROLOGICAL CONDITIONS

<u>TIME</u>	<u>PERCENT RELATIVE HUMIDITY</u>	<u>TEMPERATURE (°C)</u>	<u>PRESSURE (in. Hg)</u>
0900	28	15	29.88
1000	29	14	29.88
1100	30	15	29.86
1200	33	14	29.86
1300	32	14	29.86
1400	32	14	29.86
1500	32	14	29.86
1600	<u>32</u>	<u>14</u>	<u>29.86</u>
	Ave. = 31%	Ave. = 14°C = 57°F	Ave. = 29.86 in. Hg = 758.44 mm Hg

Temperature readings were obtained with an Ertco thermometer.

Atmospheric pressure readings were obtained with a Taylor aneroid barometer.

Percent relative humidity measurements were obtained with a Bacharach Instruments sling psychrometer.

SITE LOCATION	SAMPLE	SAMPLE VOL. (liters)	ADSORBENT	COMPOUND	CONCENTRATION		DETECTION LEVEL (ug/m ³)
					(ug/m ³)	(ppb, v/v)	
Basement	9 prim.	12	Spherocarb	<u>Vinyl Chloride</u>	ND	ND	0.4
				<u>Bromomethane</u>	ND	ND	
				<u>Chloroethane</u>	ND	ND	
				<u>Trichlorofluoromethane</u>	32	6	
				<u>1,1-Dichloroethylene</u>	4.9	1	
				<u>Methylene Chloride</u>	100	29	
				<u>t-1,2-Dichloroethylene</u>	ND	ND	
				<u>1,1-Dichloroethane</u>	ND	ND	
				<u>Chloroform</u>	2.9	0.6	
				<u>Methyl ethyl ketone</u>	ND	ND	
				<u>Bromochloromethane</u>	ND	ND	
				<u>Acetone</u>	ND	ND	
				<u>Carbon Disulfide</u>	0.7	0.2	
				<u>c-1,2-Dichloroethylene</u>	ND	ND	
				<u>Trichlorotrifluoroethane</u>	ND	ND	
				<u>Ethanol</u>	†	†	
				<u>Hydrocarbon, C6 isomers</u>	†	†	
				<u>Hydrocarbon, C5</u>	†	†	
				<u>Acetaldehyde</u>	†	†	
Basement	10 sec.	12	Spherocarb	<u>Vinyl Chloride</u>	ND	ND	0.4
				<u>Bromomethane</u>	<0.9	<0.2*	
				<u>Chloroethane</u>	ND	ND	
				<u>Trichlorofluoromethane</u>	<0.4	<0.1	
				<u>1,1-Dichloroethylene</u>	<0.4	<0.1	
				<u>Methylene Chloride</u>	3	0.8	
				<u>t-1,2-Dichloroethylene</u>	ND	ND	
				<u>1,1-Dichloroethane</u>	ND	ND	
				<u>Chloroform</u>	ND	ND	
				<u>Methyl ethyl ketone</u>	ND	ND	
				<u>Bromochloromethane</u>	ND	ND	
				<u>Acetone</u>	ND	ND	
				<u>Carbon Disulfide</u>	0.7	0.2	
				<u>c-1,2-Dichloroethylene</u>	ND	ND	
				<u>Trichlorotrifluoroethane</u>	ND	ND	
				<u>Acetaldehyde</u>	†	†	
				<u>Hydrocarbon-C4</u>	†	†	
				<u>C7-Aldehyde</u>	†	†	

Notes:

ND = none detected

† = Compounds Tentatively Identified

prim. = primary tube

sec. = secondary tube

* = Compound detected on lab blank at a level less than 5 nanograms.

< = less than

Compounds underlined are the compounds that have been detected in groundwater

SITE LOCATION	SAMPLE	SAMPLE VOL. (liters)	ADSORBENT	COMPOUND	CONCENTRATION		DETECTION LEVEL (ug/m ³)
					(ug/m ³)	(ppb, v/v)	
Basement	14 rep.	6	Spherocarb	<u>Vinyl Chloride</u>	ND	ND	0.8
				Bromomethane	ND	ND	
				Chloroethane	ND	ND	
				Trichlorofluoromethane	21	3.7	
				1,1-Dichloroethylene	14	3.5	
				Methylene Chloride	100	29	
				<u>t-1,2-Dichloroethylene</u>	ND	ND	
				1,1-Dichloroethane	ND	ND	
				Chloroform	1.3	0.3	
				Methyl ethyl ketone	ND	ND	
				Bromchloromethane	ND	ND	
				Acetone	ND	ND	
				Carbon Disulfide	ND	ND	
				c-1,2-Dichloroethylene	ND	ND	
				Trichlorotrifluoroethane	ND	ND	
				Ethanol	†	†	
				Hydrocarbon, C6 isomers	†	†	
				Hydrocarbon, C5 isomers	†	†	
				Acetaldehyde	†	†	

Notes:

ND = none detected

† = Tentatively Identified

rep. = replicate tube

Compounds underlined are the compounds that have been detected in groundwater

SITE LOCATION	SAMPLE	SAMPLE VOL. (liters)	ADSORBENT	COMPOUND	CONCENTRATION		DETECTION LEVEL (ug/m ³)
					(ug/m ³)	(ppb, v/v)	
Basement	15 dup.	6	Spherocarb	<u>Vinyl Chloride</u>	ND	ND	0.8
				Bromomethane	ND	ND	
				Chloroethane	2.1	0.8	
				Trichlorofluoromethane	17	3	
				1,1-Dichloroethylene	5	1	
				Methylene Chloride	57	16	
				<u>t-1,2-Dichloroethylene</u>	ND	ND	
				<u>1,1-Dichloroethane</u>	ND	ND	
				Chloroform	1.4	0.3	
				Methyl ethyl ketone	ND	ND	
				Bromchloromethane	ND	ND	
				Acetone	ND	ND	
				Carbon Disulfide	ND	ND	
				c-1,2-Dichloroethylene	ND	ND	
				Trichlorotrifluoroethane	ND	ND	
				Ethanol	†	†	
				Hydrocarbon, C6 isomers	†	†	
				Hydrocarbon, C5 isomers	†	†	
				Acetaldehyde	†	†	

Notes:

ND = none detected

† = Tentatively Identified

dup. = duplicate tube

Compounds underlined are the compounds that have been detected in groundwater

SITE LOCATION	SAMPLE	SAMPLE VOL. (liters)	ADSORBENT	COMPOUND	CONCENTRATION		DETECTION LEVEL (ug/m ³)
					(ug/m ³)	(ppb, v/v)	
Basement	6 prim.	12	Tenax	<u>1,1,1-Trichloroethane</u>	140	25	0.4
				Carbon Tetrachloride	1.6	0.2	
				Benzene	4.5	1.4	
				1,2-Dichloroethane	ND	ND	
				<u>Trichloroethylene</u>	<0.4	<0.1	
				1,2-Dichloropropane	ND	ND	
				Bromodichloromethane	ND	ND	
				2-Chloroethylvinyl ether	ND	ND	
				cis-1,3-dichloropropene	ND	ND	
				Methyl Isobutyl Ketone	0.7	0.2	
				Dibromomethane	ND	ND	
				Toluene	27	7.1	
				trans-1,3-Dichloropropene	ND	ND	
				1,1,2-Trichloroethane	ND	ND	
				<u>Tetrachloroethylene</u>	6.3	0.9	
				1,3-Dichloropropane	ND	ND	
				Dibromochloromethane	ND	ND	
				1,2-Dibromoethane	ND	ND	
				Chlorobenzene	ND	ND	
				Ethylbenzene	3.6	0.8	
				Bromoform	ND	ND	
				1,2-Dichlorobenzene	ND	ND	
				Xylenes (total)	22	5.2	
				Styrene	ND	ND	
				Isopropylbenzene	ND	ND	
				1,1,2,2-Tetrachloroethane	ND	ND	
				Bromobenzene	ND	ND	
				1,2,3-Trichloropropane	ND	ND	
				n-Propylbenzene	ND	ND	
				2-Chlorotoluene	ND	ND	
				1,3,5-Trimethylbenzene	17	3.5	
				4-Chlorotoluene	ND	ND	
				t-Butylbenzene	ND	ND	
				1,2,4-Trimethylbenzene	27	5.4	
				s-Butylbenzene	ND	ND	
				p-Isopropyltoluene	ND	ND	
				1,3-Dichlorobenzene	ND	ND	
				1,4-Dichlorobenzene	22	3.7	
				n-Butylbenzene	ND	ND	
				1,2-Dibromo-3-chloropropane	ND	ND	
				1,2,4-Trichlorobenzene	ND	ND	
				Hexachlorobutadiene	ND	ND	
				Naphthalene	3.3	0.6	
				<u>1,2,3-Trichlorobenzene</u>	ND	ND	

Compounds Tentatively Identified: Hydrocarbon-C6 isomers, Hydrocarbon-C7 isomers, Hydrocarbon-C8 isomers, Hydrocarbon-C9 isomers, Hydrocarbon-C10 isomers, Hydrocarbon-C11 isomers, Hydrocarbon-C12 isomers, Hexanal

Notes: ND = none detected
prim. = primary tube
< = less than

Compounds underlined are the compounds that have been detected in groundwater

SITE LOCATION	SAMPLE	SAMPLE VOL. (liters)	ADSORBENT	COMPOUND	CONCENTRATION		DETECTION LEVEL (ug/m ³)
					(ug/m ³)	(ppb, v/v)	
Basement	7 sec.	12	Tenax	<u>1,1,1-Trichloroethane</u>	1.5	0.3	0.4
				Carbon Tetrachloride	ND	ND	
				Benzene	<1.2	<0.4*	
				<u>1,2-Dichloroethane</u>	ND	ND	
				<u>Trichloroethylene</u>	ND	ND	
				<u>1,2-Dichloropropane</u>	ND	ND	
				Bromodichloromethane	ND	ND	
				2-Chloroethylvinyl ether	ND	ND	
				cis-1,3-dichloropropene	ND	ND	
				Methyl Isobutyl Ketone	ND	ND	
				Dibromomethane	ND	ND	
				Toluene	0.4	0.1	
				trans1,3-Dichloropropene	ND	ND	
				<u>1,1,2-Trichloroethane</u>	ND	ND	
				<u>Tetrachloroethylene</u>	<0.4	<0.1	
				<u>1,3-Dichloropropane</u>	ND	ND	
				Dibromochloromethane	ND	ND	
				<u>1,2-Dibromoethane</u>	ND	ND	
				Chlorobenzene	ND	ND	
				Ethylbenzene	<0.4	<0.1	
				Bromoform	ND	ND	
				<u>1,2-Dichlorobenzene</u>	ND	ND	
				Xylenes (total)	<0.4	<0.1	
				Styrene	ND	ND	
				Isopropylbenzene	ND	ND	
				<u>1,1,2,2-Tetrachloroethane</u>	ND	ND	
				Bromobenzene	ND	ND	
				<u>1,2,3-Trichloropropane</u>	ND	ND	
				n-Propylbenzene	ND	ND	
				2-Chlorotoluene	ND	ND	
				<u>1,3,5-Trimethylbenzene</u>	<0.4	<0.1	
				4-Chlorotoluene	ND	ND	
				t-Butylbenzene	ND	ND	
				<u>1,2,4-Trimethylbenzene</u>	<0.4	<0.1	
				s-Butylbenzene	ND	ND	
				p-Isopropyltoluene	ND	ND	
				<u>1,3-Dichlorobenzene</u>	ND	ND	
				<u>1,4-Dichlorobenzene</u>	<0.4	<0.1	
				n-Butylbenzene	ND	ND	
				<u>1,2Dibromo3chloropropane</u>	ND	ND	
				<u>1,2,4-Trichlorobenzene</u>	ND	ND	
				Hexachlorobutadiene	ND	ND	
				Naphthalene	<0.4	<0.1	
				<u>1,2,3-Trichlorobenzene</u>	ND	ND	

Compounds Tentatively Identified: Hydrocarbon-C6, Hydrocarbon-C7, Hydrocarbon-C9, Hydrocarbon-C10, Hydrocarbon-C11

Notes: ND = none detected

sec. = secondary tube

< = less than

Compounds underlined are the compounds that have been detected in groundwater

* = Compound detected on lab blank at a level less than 5 nanograms.

SITE LOCATION	SAMPLE	SAMPLE VOL. (liters)	ADSORBENT	COMPOUND	CONCENTRATION		DETECTION LEVEL (ug/m ³)
					(ug/m ³)	(ppb, v/v)	
Basement	8 rep.	6	Tenax	<u>1,1,1-Trichloroethane</u>	130	24	0.8
				Carbon Tetrachloride	1.6	0.2	
				Benzene	4.7	1.5	
				1,2-Dichloroethane	ND	ND	
				<u>Trichloroethylene</u>	<0.8	<0.2	
				<u>1,2-Dichloropropane</u>	ND	ND	
				Bromodichloromethane	ND	ND	
				2-Chloroethylvinyl ether	ND	ND	
				cis-1,3-dichloropropene	ND	ND	
				Methyl Isobutyl Ketone	<0.8	<0.2	
				Dibromomethane	ND	ND	
				Toluene	26	6.9	
				trans-1,3-Dichloropropene	ND	ND	
				1,1,2-Trichloroethane	ND	ND	
				<u>Tetrachloroethylene</u>	6.1	0.9	
				<u>1,3-Dichloropropane</u>	ND	ND	
				Dibromochloromethane	ND	ND	
				1,2-Dibromoethane	ND	ND	
				Chlorobenzene	ND	ND	
				Ethylbenzene	3.8	0.9	
				Bromoform	ND	ND	
				1,2-Dichlorobenzene	ND	ND	
				Xylenes (total)	22	4.9	
				Styrene	ND	ND	
				Isopropylbenzene	ND	ND	
				1,1,2,2-Tetrachloroethane	ND	ND	
				Bromobenzene	ND	ND	
				1,2,3-Trichloropropane	ND	ND	
				n-Propylbenzene	ND	ND	
				2-Chlorotoluene	ND	ND	
				1,3,5-Trimethylbenzene	17	3.5	
				4-Chlorotoluene	ND	ND	
				t-Butylbenzene	ND	ND	
				1,2,4-Trimethylbenzene	26	5.4	
				s-Butylbenzene	ND	ND	
				p-Isopropyltoluene	ND	ND	
				1,3-Dichlorobenzene	ND	ND	
				1,4-Dichlorobenzene	21	3.4	
				n-Butylbenzene	ND	ND	
				1,2-Dibromo-3-chloropropane	ND	ND	
				1,2,4-Trichlorobenzene	ND	ND	
				Hexachlorobutadiene	ND	ND	
				Naphthalene	3.2	0.6	
				<u>1,2,3-Trichlorobenzene</u>	ND	ND	

Compounds Tentatively Identified: Hydrocarbon-C5, Hydrocarbon-C6, Hydrocarbon-C7, Hydrocarbon-C8 isomers, Hydrocarbon-C9 isomers, Hydrocarbon-C10 isomers, Hydrocarbon-C11 isomers, hydrocarbon-C18, Methyl ethyl ketone, Pyrrolidine

Notes: ND = none detected
rep. = replicate tube
< = less than

Compounds underlined are the compounds that have been detected in groundwater

SITE LOCATION	SAMPLE	SAMPLE VOL. (liters)	ADSORBENT	COMPOUND	CONCENTRATION		DETECTION LEVEL (ug/m ³)
					(ug/m ³)	(ppb, v/v)	
Basement	9 dup.	6	Tenax	<u>1,1,1-Trichloroethane</u>	96	17	0.8
				Carbon Tetrachloride	1.3	0.2	
				Benzene	3.6	1.1	
				1,2-Dichloroethane	ND	ND	
				<u>Trichloroethylene</u>	<0.8	<0.2	
				1,2-Dichloropropane	ND	ND	
				Bromodichloromethane	ND	ND	
				2-Chloroethylvinyl ether	ND	ND	
				cis-1,3-dichloropropene	ND	ND	
				Methyl Isobutyl Ketone	<0.8	<0.2	
				Dibromomethane	ND	ND	
				Toluene	19	5.1	
				trans-1,3-Dichloropropene	ND	ND	
				1,1,2-Trichloroethane	ND	ND	
				<u>Tetrachloroethylene</u>	4.8	0.7	
				1,3-Dichloropropane	ND	ND	
				Dibromochloromethane	ND	ND	
				1,2-Dibromoethane	ND	ND	
				Chlorobenzene	ND	ND	
				Ethylbenzene	2.6	0.6	
				Bromoform	ND	ND	
				1,2-Dichlorobenzene	ND	ND	
				Xylenes (total)	16	3.7	
				Styrene	ND	ND	
				Isopropylbenzene	ND	ND	
				1,1,2,2-Tetrachloroethane	ND	ND	
				Bromobenzene	ND	ND	
				1,2,3-Trichloropropane	ND	ND	
				n-Propylbenzene	ND	ND	
				2-Chlorotoluene	ND	ND	
				1,3,5-Trimethylbenzene	12	2.5	
				4-Chlorotoluene	ND	ND	
				t-Butylbenzene	ND	ND	
				1,2,4-Trimethylbenzene	19	4	
				s-Butylbenzene	ND	ND	
				p-Isopropyltoluene	ND	ND	
				1,3-Dichlorobenzene	ND	ND	
				1,4-Dichlorobenzene	15	2.6	
				n-Butylbenzene	ND	ND	
				1,2-Dibromo-3-chloropropane	ND	ND	
				1,2,4-Trichlorobenzene	ND	ND	
				Hexachlorobutadiene	ND	ND	
				Naphthalene	2.3	0.4	
				1,2,3-Trichlorobenzene	ND	ND	

Compounds Tentatively Identified: Hydrocarbon-C4, Hydrocarbon-C5, Hydrocarbon-C6 isomers, Hydrocarbon-C7 isomers, Hydrocarbon-C9 isomers, Hydrocarbon-C10 isomers, Hydrocarbon-C11 isomers, Hydrocarbon-C12, Hydrocarbon-C13

Notes: ND = none detected

dup. = duplicate tube

< = less than

Compounds underlined are the compounds that have been detected in groundwater

SITE LOCATION	SAMPLE	SAMPLE VOL. (liters)	ADSORBENT	COMPOUND	AMOUNT (ng)	CONCENTRATION (ppb, v/v)	DETECT LEVE (ng)
Trip Blank	11	NA	Spherocarb	Vinyl Chloride	ND	NA	5
				Bromomethane	ND	NA	
				Chloroethane	<11*	NA	
				Trichlorofluoromethane	ND	NA	
				1,1-Dichloroethylene	ND	NA	
				Methylene Chloride	<29*	NA	
				<u>t-1,2-Dichloroethylene</u>	ND	NA	
				<u>1,1-Dichloroethane</u>	ND	NA	
				Chloroform	ND	NA	
				Methyl ethyl ketone	ND	NA	
				Bromchloromethane	ND	NA	
				Acetone	20	NA	
				Carbon Disulfide	6.5	NA	
				c-1,2-Dichloroethylene	ND	NA	
				Trichlorotrifluoroethane	ND	NA	
				Hydrocarbon-C6	†	†	

Notes:

ND = none detected

NA = not applicable

Compounds underlined are the compounds that have been detected in groundwater

† = Compounds Tentatively Identified

* = Compound detected on lab blank at a level less than 5 nanograms.

< = less than

SITE LOCATION	SAMPLE	SAMPLE VOL. (liters)	ADSORBENT	COMPOUND	AMOUNT (ng)	CONCENTRATION (ppb, v/v)	DETECT. LEVEL (ng)
Trip Blank	10	NA	Tenax	<u>1,1,1-Trichloroethane</u>	ND	NA	5
				<u>Carbon Tetrachloride</u>	<14*	NA	
				Benzene	ND	NA	
				<u>1,2-Dichloroethane</u>	ND	NA	
				<u>Trichloroethylene</u>	ND	ND	
				<u>1,2-Dichloropropane</u>	ND	NA	
				Bromodichloromethane	ND	NA	
				2-Chloroethylvinyl ether	ND	NA	
				cis-1,3-dichloropropene	ND	NA	
				Methyl Isobutyl Ketone	ND	NA	
				Dibromomethane	ND	NA	
				Toluene	<5 *	NA	
				trans-1,3-Dichloropropene	ND	NA	
				<u>1,1,2-Trichloroethane</u>	ND	NA	
				<u>Tetrachloroethylene</u>	<5	NA	
				<u>1,3-Dichloropropane</u>	ND	NA	
				Dibromochloromethane	ND	NA	
				<u>1,2-Dibromoethane</u>	ND	NA	
				Chlorobenzene	ND	NA	
				Ethylbenzene	ND	NA	
				Bromoform	ND	NA	
				<u>1,2-Dichlorobenzene</u>	ND	NA	
				Xylenes (total)	ND	NA	
				Styrene	ND	NA	
				Isopropylbenzene	ND	NA	
				<u>1,1,2,2-Tetrachloroethane</u>	ND	NA	
				Bromobenzene	ND	NA	
				<u>1,2,3-Trichloropropane</u>	ND	NA	
				n-Propylbenzene	ND	NA	
				2-Chlorotoluene	ND	NA	
				<u>1,3,5-Trimethylbenzene</u>	<5	NA	
				4-Chlorotoluene	ND	NA	
				t-Butylbenzene	ND	NA	
				<u>1,2,4-Trimethylbenzene</u>	<5	NA	
				s-Butylbenzene	ND	NA	
				p-Isopropyltoluene	ND	NA	
				<u>1,3-Dichlorobenzene</u>	ND	NA	
				<u>1,4-Dichlorobenzene</u>	ND	NA	
				n-Butylbenzene	ND	NA	
				<u>1,2-Dibromo-3-chloropropane</u>	ND	NA	
				<u>1,2,4-Trichlorobenzene</u>	ND	NA	
				Hexachlorobutadiene	ND	NA	
				Naphthalene	<5	NA	
				<u>1,2,3-Trichlorobenzene</u>	ND	NA	

Compounds Tentatively Identified: Hydrocarbon-C6

Notes: ND = none detected

NA = not applicable

Compounds underlined are the compounds that have been detected in groundwater

< = less than

* = Compound detected on lab blank at a level less than 5 nanograms.

TABLE 8

APRIL 26, 1989 REDACTED

BASEMENT METEOROLOGICAL CONDITIONS

<u>TIME</u>	<u>PERCENT RELATIVE HUMIDITY</u>	<u>TEMPERATURE (°C)</u>	<u>PRESSURE (in. Hg)</u>
0900	42	17	29.96
1005	43	18	29.92
1108	44	18	29.90
1200	43	18	29.90
1305	44	17	29.86
1405	44	17	29.86
1500	44	17	29.84
1600	<u>44</u>	<u>17</u>	<u>29.82</u>
	Ave. = 44%	Ave. = 17°C = 63°F	Ave. = 29.88 in. Hg = 758.95 mm Hg

Temperature readings were obtained with an Ertco thermometer.

Atmospheric pressure readings were obtained with a Taylor aneroid barometer.

Percent relative humidity measurements were obtained with a Bacharach Instruments sling psychrometer.

SITE LOCATION	SAMPLE	SAMPLE VOL. (liters)	ADSORBENT	COMPOUND	CONCENTRATION		DETECTI LEVEL (ug/m ³)
					(ug/m ³)	(ppb, v/v)	
Basement	17 prim.	12	Spherocarb	<u>Vinyl Chloride</u>	ND	ND	0.4
				Bromomethane	0.6	0.2	
				Chloroethane	ND	ND	
				Trichlorofluoromethane	7.0	1.2	
				<u>1,1-Dichloroethylene</u>	0.5	0.1	
				Methylene Chloride	8.8	2.5	
				<u>t-1,2-Dichloroethylene</u>	ND	ND	
				<u>1,1-Dichloroethane</u>	ND	ND	
				Chloroform	ND	ND	
				Methyl ethyl ketone	ND	ND	
				Bromochloromethane	ND	ND	
				Acetone	30	13	
				Carbon Disulfide	ND	ND	
				c-1,2-Dichloroethylene	ND	ND	
				Trichlorotrifluoroethane	ND	ND	
				Hydrocarbon,C6	†	†	
				Isoxazole	†	†	
Basement	19 sec.	12	Spherocarb	<u>Vinyl Chloride</u>	ND	ND	0.4
				Bromomethane	<0.9*	<0.2*	
				Chloroethane	ND	ND	
				Trichlorofluoromethane	ND	ND	
				<u>1,1-Dichloroethylene</u>	ND	ND	
				Methylene Chloride	<2.4*	<0.7*	
				<u>t-1,2-Dichloroethylene</u>	ND	ND	
				<u>1,1-Dichloroethane</u>	ND	ND	
				Chloroform	ND	ND	
				Methyl ethyl ketone	ND	ND	
				Bromochloromethane	ND	ND	
				Acetone	ND	ND	
				Carbon Disulfide	ND	ND	
				c-1,2-Dichloroethylene	ND	ND	
				Trichlorotrifluoroethane	ND	ND	
				Hydrocarbon,C6	†	†	

Notes:

ND = none detected

† = Tentatively Identified

prim. = primary tube

sec. = secondary tube

* = Compound detected on lab blank at a level less than 5 nanograms.

< = less than

Compounds underlined are the compounds that have been detected in groundwater

SITE LOCATION	SAMPLE	SAMPLE VOL. (liters)	ADSORBENT	COMPOUND	CONCENTRATION		DETECTION LEVEL (ug/m ³)
					(ug/m ³)	(ppb, v/v)	
Basement	21 rep.	7	Spherocarb	Vinyl Chloride	ND	ND	0.7
				Bromomethane	<1.6*	<4.0*	
				Chloroethane	ND	ND	
				Trichlorofluoromethane	3.3	0.6	
				1,1-Dichloroethylene	<0.7	<0.1	
				Methylene Chloride	5.0	1.4	
				<u>t-1,2-Dichloroethylene</u>	ND	ND	
				<u>1,1-Dichloroethane</u>	ND	ND	
				Chloroform	ND	ND	
				Methyl ethyl ketone	ND	ND	
				Bromochloromethane	ND	ND	
				Acetone	22	9.4	
				Carbon Disulfide	ND	ND	
				c-1,2-Dichloroethylene	ND	ND	
				Trichlorotrifluoroethane	ND	ND	
				Urea	†	†	
				Hydrocarbon, C6	†	†	

Notes:

ND = none detected

† = Tentatively Identified

rep. = replicate tube

* = Compound detected on lab blank at a level less than 5 nanograms.

< = less than

Compounds underlined are the compounds that have been detected in groundwater

SITE LOCATION	SAMPLE	SAMPLE VOL. (liters)	ADSORBENT	COMPOUND	CONCENTRATION		DETECTION LEVEL (ug/m ³)
					(ug/m ³)	(ppb, v/v)	
Basement	22 dup.	6	Spherocarb	<u>Vinyl Chloride</u>	ND	ND	0.8
				Bromomethane	3.0	0.8	
				Chloroethane	ND	ND	
				Trichlorofluoromethane	4.4	0.8	
				1,1-Dichloroethylene	<0.8	<0.2	
				Methylene Chloride	7.2	2.1	
				<u>t-1,2-Dichloroethylene</u>	ND	ND	
				<u>1,1-Dichloroethane</u>	ND	ND	
				Chloroform	ND	ND	
				Methyl ethyl ketone	ND	ND	
				Bromchloromethane	ND	ND	
				Acetone	31	13	
				Carbon Disulfide	ND	ND	
				c-1,2-Dichloroethylene	ND	ND	
				Trichlorotrifluoroethane	ND	ND	
				Hydrocarbon, C6	†	†	

Notes:

ND = none detected

† = Tentatively Identified

dup. = duplicate tube

* = Compound detected on lab blank at a level less than 5 nanograms.

< = less than

Compounds underlined are the compounds that have been detected in groundwater

SITE LOCATION	SAMPLE	SAMPLE VOL.	ADSORBENT	COMPOUND	CONCENTRATION		DETECTIO LEVEL (ug/m ³)
		(liters)			(ug/m ³)	(ppb, v/v)	
Basement	11 prim.	12	Tenax	<u>1,1,1-Trichloroethane</u>	15	2.8	0.4
				Carbon Tetrachloride	1.6	0.3	
				Benzene	3.3	1.0	
				1,2-Dichloroethane	0.6	0.1	
				<u>Trichloroethylene</u>	ND	ND	
				1,2-Dichloropropane	ND	ND	
				Bromodichloromethane	ND	ND	
				2-Chloroethylvinyl ether	ND	ND	
				cis-1,3-dichloropropene	ND	ND	
				Methyl Isobutyl Ketone	ND	ND	
				Dibromomethane	ND	ND	
				Toluene	24	6.4	
				trans-1,3-Dichloropropene	ND	ND	
				1,1,2-Trichloroethane	ND	ND	
				<u>Tetrachloroethylene</u>	4.3	0.6	
				1,3-Dichloropropane	ND	ND	
				Dibromochloromethane	ND	ND	
				1,2-Dibromoethane	ND	ND	
				Chlorobenzene	ND	ND	
				Ethylbenzene	3.0	0.7	
				Bromoform	ND	ND	
				Xylenes (total)	12	2.7	
				Styrene	ND	ND	
				Isopropylbenzene	ND	ND	
				1,1,2,2-Tetrachloroethane	ND	ND	
				Bromobenzene	ND	ND	
				1,2,3-Trichloropropane	ND	ND	
				n-Propylbenzene	ND	ND	
				2-Chlorotoluene	ND	ND	
				1,3,5-Trimethylbenzene	3.4	0.7	
				4-Chlorotoluene	ND	ND	
				t-Butylbenzene	ND	ND	
				1,2,4-Trimethylbenzene	2.4	0.5	
				s-Butylbenzene	ND	ND	
				p-Isopropyltoluene	ND	ND	
				1,3-Dichlorobenzene	ND	ND	
				1,4-Dichlorobenzene	ND	ND	
				n-Butylbenzene	ND	ND	
				1,2-Dichlorobenzene	ND	ND	
				1,2-Dibromo-3-chloropropane	ND	ND	
				1,2,4-Trichlorobenzene	ND	ND	
				Hexachlorobutadiene	ND	ND	
				Naphthalene	0.9	0.2	
				1,2,3-Trichlorobenzene	ND	ND	

Compounds Tentatively Identified: Hydrocarbon-C6 isomers, Hydrocarbon-C7 isomers, Hydrocarbon-C8 isomers, Hydrocarbon-C9 isomers, Hydrocarbon-C10 isomers, Hydrocarbon-C12 isomers, Hydrocarbon-C13 isomers, Hexanal, Aliphatic Alcohol C-8, Oxirane-dimethyl, Pentanal

Notes: ND = none detected

prim. = primary tube

Compounds underlined are the compounds that have been detected in groundwater

✓✓

SITE LOCATION	SAMPLE	SAMPLE VOL. (liters)	ADSORBENT	COMPOUND	CONCENTRATION		DETECTION LEVEL (ug/m ³)
					(ug/m ³)	(ppb, v/v)	
Basement	12 sec.	12	Tenax	<u>1,1,1-Trichloroethane</u>	ND	ND	0.4
				Carbon Tetrachloride	ND	ND	
				Benzene	ND	ND	
				1,2-Dichloroethane	ND	ND	
				<u>Trichloroethylene</u>	ND	ND	
				<u>1,2-Dichloropropane</u>	ND	ND	
				Bromodichloromethane	ND	ND	
				2-Chloroethylvinyl ether	ND	ND	
				cis-1,3-dichloropropene	ND	ND	
				Methyl Isobutyl Ketone	ND	ND	
				Dibromomethane	ND	ND	
				Toluene	<0.6*	<0.2*	
				trans-1,3-Dichloropropene	ND	ND	
				1,1,2-Trichloroethane	ND	ND	
				<u>Tetrachloroethylene</u>	<0.4*	<0.1*	
				1,3-Dichloropropane	ND	ND	
				Dibromochloromethane	ND	ND	
				1,2-Dibromomethane	ND	ND	
				Chlorobenzene	ND	ND	
				Ethylbenzene	<0.4	<0.1	
				Bromoform	ND	ND	
				Xylenes (total)	<0.4	<0.1	
				Styrene	ND	ND	
				Isopropylbenzene	ND	ND	
				1,1,2,2-Tetrachloroethane	ND	ND	
				Bromobenzene	ND	ND	
				1,2,3-Trichloropropane	ND	ND	
				n-Propylbenzene	ND	ND	
				2-Chlorotoluene	ND	ND	
				1,3,5-Trimethylbenzene	<0.4	<0.1	
				4-Chlorotoluene	ND	ND	
				t-Butylbenzene	ND	ND	
				1,2,4-Trimethylbenzene	<0.4	<0.1	
				s-Butylbenzene	ND	ND	
				p-Isopropyltoluene	ND	ND	
				1,3-Dichlorobenzene	ND	ND	
				1,4-Dichlorobenzene	ND	ND	
				n-Butylbenzene	ND	ND	
				1,2-Dibromo-3-chloropropane	ND	ND	
				1,2,4-Trichlorobenzene	ND	ND	
				Hexachlorobutadiene	ND	ND	
				Naphthalene	<0.4*	<0.1*	
				1,2,3-Trichlorobenzene	ND	ND	

Compounds Tentatively Identified: Hydrocarbon-C6, Hydrocarbon-C12, Hydrocarbon-C13

Notes: ND = none detected

sec. = secondary tube

< = less than

* = Compound detected on lab blank at a level less than 5 nanograms.

Compounds underlined are the compounds that have been detected in groundwater

SITE LOCATION	SAMPLE	SAMPLE VOL. (liters)	ADSORBENT	COMPOUND	CONCENTRATION		DETECTI LEVEL (ug/m ³)
					(ug/m ³)	(ppb, v/v)	
Basement	13 rep.	6	Tenax	<u>1,1,1-Trichloroethane</u>	11	2.0	0.8
				Carbon Tetrachloride	1.2	<0.2	
				Benzene	2.5	0.8	
				<u>1,2-Dichloroethane</u>	ND	ND	
				<u>Trichloroethylene</u>	ND	ND	
				<u>1,2-Dichloropropane</u>	ND	ND	
				Bromodichloromethane	ND	ND	
				2-Chloroethylvinyl ether	ND	ND	
				cis-1,3-dichloropropene	ND	ND	
				Methyl Isobutyl Ketone	<0.8	<0.2	
				Dibromomethane	ND	ND	
				Toluene	17	4.5	
				trans-1,3-Dichloropropene	ND	ND	
				<u>1,1,2-Trichloroethane</u>	ND	ND	
				<u>Tetrachloroethylene</u>	2.7	0.4	
				<u>1,3-Dichloropropane</u>	ND	ND	
				Dibromochloromethane	ND	ND	
				1,2-Dibromoethane	ND	ND	
				Chlorobenzene	ND	ND	
				Ethylbenzene	2.0	0.5	
				Bromoform	ND	ND	
				1,2-Dichlorobenzene	ND	ND	
				Xylenes (total)	8.0	1.8	
				Styrene	ND	ND	
				Isopropylbenzene	ND	ND	
				1,1,2,2-Tetrachloroethane	ND	ND	
				Bromobenzene	ND	ND	
				1,2,3-Trichloropropane	ND	ND	
				n-Propylbenzene	ND	ND	
				2-Chlorotoluene	ND	ND	
				1,3,5-Trimethylbenzene	2.5	0.5	
				4-Chlorotoluene	ND	ND	
				t-Butylbenzene	ND	ND	
				1,2,4-Trimethylbenzene	1.6	0.3	
				s-Butylbenzene	ND	ND	
				p-Isopropyltoluene	ND	ND	
				1,3-Dichlorobenzene	ND	ND	
				1,4-Dichlorobenzene	ND	ND	
				n-Butylbenzene	ND	ND	
				1,2-Dibromo-3-chloropropane	ND	ND	
				1,2,4-Trichlorobenzene	ND	ND	
				Hexachlorobutadiene	ND	ND	
				Naphthalene	<0.8	<0.2	
				<u>1,2,3-Trichlorobenzene</u>	ND	ND	

Compounds Tentatively Identified: Hydrocarbon-C6 isomers, Hydrocarbon-C8 isomers, Hydrocarbon-C9 isomers, Hydrocarbon-C10 isomers, Hydrocarbon-C11 isomers, Hydrocarbon-C12 isomers, Hexenal

Notes: ND = none detected
rep. = replicate tube
< = less than

Compounds underlined are the compounds that have been detected in groundwater

SITE LOCATION	SAMPLE	SAMPLE VOL. (liters)	ADSORBENT	COMPOUND	CONCENTRATION		DETECTION LEVEL (ug/m ³)
					(ug/m ³)	(ppb, v/v)	
Basement	14 dup.	7	Tenax	<u>1,1,1-Trichloroethane</u>	8.2	1.5	0.7
				Carbon Tetrachloride	1.0	0.2	
				Benzene	2.5	0.8	
				1,2-Dichloroethane	ND	ND	
				<u>Trichloroethylene</u>	ND	ND	
				<u>1,2-Dichloropropane</u>	ND	ND	
				Bromodichloromethane	ND	ND	
				2-Chloroethylvinyl ether	ND	ND	
				cis-1,3-dichloropropene	ND	ND	
				Methyl Isobutyl Ketone	ND	ND	
				Dibromomethane	ND	ND	
				Toluene	16	4.1	
				trans-1,3-Dichloropropene	ND	ND	
				1,1,2-Trichloroethane	ND	ND	
				<u>Tetrachloroethylene</u>	2.7	0.4	
				1,3-Dichloropropane	ND	ND	
				Dibromochloromethane	ND	ND	
				1,2-Dibromomethane	ND	ND	
				Chlorobenzene	ND	ND	
				Ethylbenzene	1.9	0.4	
				Bromoform	ND	ND	
				1,2-Dichlorobenzene	ND	ND	
				Xylenes (total)	7.2	1.7	
				Styrene	ND	ND	
				Isopropylbenzene	ND	ND	
				1,1,2,2-Tetrachloroethane	ND	ND	
				Bromobenzene	ND	ND	
				1,2,3-Trichloropropane	ND	ND	
				n-Propylbenzene	ND	ND	
				2-Chlorotoluene	ND	ND	
				1,3,5-Trimethylbenzene	2.2	0.4	
				4-Chlorotoluene	ND	ND	
				t-Butylbenzene	ND	ND	
				1,2,4-Trimethylbenzene	1.7	0.4	
				s-Butylbenzene	ND	ND	
				p-Isopropyltoluene	ND	ND	
				1,3-Dichlorobenzene	ND	ND	
				1,4-Dichlorobenzene	ND	ND	
				n-Butylbenzene	ND	ND	
				1,2-Dibromo-3-chloropropane	ND	ND	
				1,2,4-Trichlorobenzene	ND	ND	
				Hexachlorobutadiene	ND	ND	
				Naphthalene	0.8	0.1	
				1,2,3-Trichlorobenzene	ND	ND	

Compounds Tentatively Identified: Hydrocarbon-C6 isomers, Hydrocarbon-C7 isomers, Hydrocarbon-C8 isomers, Hydrocarbon-C9 isomers, Hydrocarbon-C10 isomers, Hydrocarbon-C11 isomers, Hydrocarbon-C1 isomers, Hydrocarbon-C15 isomers

Notes: ND = none detected

dup. = duplicate tube

Compounds underlined are the compounds that have been detected in groundwater

SITE LOCATION	SAMPLE	SAMPLE VOL. (liters)	ADSORBENT	COMPOUND	AMOUNT (ng)	CONCENTRATION (ppb, v/v)	DETECT LEVE (ng)
Trip Blank	20	NA	Spherocarb	Vinyl Chloride	ND	NA	5
				Bromomethane	<11*	NA	
				Chloroethane	ND	NA	
				Trichlorofluoromethane	ND	NA	
				<u>1,1-Dichloroethylene</u>	ND	NA	
				Methylene Chloride	<29*	NA	
				<u>t-1,2-Dichloroethylene</u>	ND	NA	
				<u>1,1-Dichloroethane</u>	ND	NA	
				Chloroform	ND	NA	
				Methyl ethyl ketone	ND	NA	
				Bromchloromethane	ND	NA	
				Acetone	24	NA	
				Carbon Disulfide	ND	NA	
				c-1,2-Dichloroethylene	ND	NA	
				Trichlorotrifluoroethane	ND	NA	

Notes:

ND = none detected

NA = not applicable

Compounds underlined are the compounds that have been detected in groundwater

< = less than

* = Compound detected on lab blank at a level less than 5 nanograms.

SITE LOCATION	SAMPLE	SAMPLE VOL. (liters)	ADSORBENT	COMPOUND	AMOUNT (ng)	CONCENTRATION (ppb, v/v)	DETECT LEVEL (ng)
Trip Blank	15	NA	Tenax	<u>1,1,1-Trichloroethane</u>	ND	NA	5
				Carbon Tetrachloride	ND	NA	
				Benzene	ND	NA	
				1,2-Dichloroethane	ND	NA	
				<u>Trichloroethylene</u>	ND	ND	
				1,2-Dichloropropane	ND	NA	
				Bromodichloromethane	ND	NA	
				2-Chloroethylvinyl ether	ND	NA	
				cis-1,3-dichloropropene	ND	NA	
				Methyl Isobutyl Ketone	ND	NA	
				Dibromomethane	ND	NA	
				Toluene	<7.0	NA	
				trans-1,3-Dichloropropene	ND	NA	
				1,1,2-Trichloroethane	ND	NA	
				<u>Tetrachloroethylene</u>	<5.0	NA	
				1,3-Dichloropropane	ND	NA	
				Dibromochloromethane	ND	NA	
				1,2-Dibromomethane	ND	NA	
				Chlorobenzene	ND	NA	
				Ethylbenzene	ND	NA	
				Bromoform	ND	NA	
				1,2-Dichlorobenzene	ND	NA	
				Xylenes (total)	ND	NA	
				Styrene	ND	NA	
				Isopropylbenzene	ND	NA	
				1,1,2,2-Tetrachloroethane	ND	NA	
				Bromobenzene	ND	NA	
				1,2,3-Trichloropropane	ND	NA	
				n-Propylbenzene	ND	NA	
				2-Chlorotoluene	ND	NA	
				1,3,5-Trimethylbenzene	ND	NA	
				4-Chlorotoluene	ND	NA	
				t-Butylbenzene	ND	NA	
				1,2,4-Trimethylbenzene	ND	NA	
				s-Butylbenzene	ND	NA	
				p-Isopropyltoluene	ND	NA	
				1,3-Dichlorobenzene	ND	NA	
				1,4-Dichlorobenzene	ND	NA	
				n-Butylbenzene	ND	NA	
				1,2-Dibromo-3-chloropropane	ND	NA	
				1,2,4-Trichlorobenzene	ND	NA	
				Hexachlorobutadiene	ND	NA	
				Naphthalene	<5.0	NA	
				1,2,3-Trichlorobenzene	ND	NA	

Compounds Tentatively Identified: Hydrocarbon-C6

Notes: ND = none detected

NA = not applicable

Compounds underlined are the compounds that have been detected in groundwater

< = less than

TABLE 11

APRIL 27, 1989

REDACTED

BASEMENT METEOROLOGICAL CONDITIONS

<u>TIME</u>	<u>PERCENT RELATIVE HUMIDITY</u>	<u>TEMPERATURE (°C)</u>	<u>PRESSURE (in. Hg)</u>
0900	50	12	29.88
1000	50	11	29.90
1100	48	12	29.89
1215	50	11	29.89
1310	50	11	29.89
1400	48	11	29.86
1500	50	11	29.84
1615	<u>50</u>	<u>11</u>	<u>29.84</u>
	Ave. = 50	Ave. = 11°C = 52°F	Ave. = 29.87 in. Hg = 758.70 mm Hg

Temperature readings were obtained with an Ertco thermometer.

Atmospheric pressure readings were obtained with a Taylor aneroid barometer.

Percent relative humidity measurements were obtained with a Bacharach Instruments sling psychrometer.

TABLE 12

REDACTED

EIGHT-HOUR VOLATILE ORGANIC COMPOUND DATA SUMMARY

Compound *	Basement			
	Primary (ppb)	Secondary (ppb)	Replicate (ppb)	Duplicate (ppb)
<u>1,1,1-Trichloroethane</u>	4.9	0.5	4.6	5.5
Carbon Tetrachloride	0.2	<0.1	0.2	0.2
Benzene	0.5	<0.4	<0.7	<0.7
1,2-Dichloroethane	ND	ND	ND	ND
<u>Trichloroethylene</u>	<0.1	ND	<0.2	<0.2
Methyl Isobutyl Ketone	ND	ND	<0.2	<0.2
Toluene	1.7	0.2	1.5	2.0
<u>Tetrachloroethylene</u>	0.3	<0.1	0.3	0.4
Ethylbenzene	0.2	<0.1	<0.2	0.3
Xylenes(total)	0.9	0.1	0.9	1.1
1,3,5-Trimethylbenzene	0.3	<0.1	0.4	0.4
1,2,4-Trimethylbenzene	0.2	<0.1	0.2	0.3
1,4-Dichlorobenzene	1.2	0.2	1.2	1.6
Naphthalene	0.2	<0.1	<0.2	0.3
Trichlorofluoromethane	2.0	0.5	2.8	2.2
1,1-Dichloroethylene	0.9	0.2	1.4	0.9
Methylene Chloride	2.3	<0.7	2.5	2.8
Chloroform	ND	ND	ND	ND
Carbon Disulfide	ND	ND	ND	ND
Bromomethane	ND	ND	ND	ND
Chloroethane	ND	ND	ND	ND
Acetone	ND	ND	ND	ND

Notes: ND = none detected, compound not detected above the lower limit of detection
 < = less than
 * = compounds identified above detection limits in either of the homes
 Compounds underlined are the compounds that have been identified to be present in groundwater.

TABLE 13

REDACTED

EIGHT-HOUR VOLATILE ORGANIC COMPOUND DATA SUMMARY

Compound *	Basement			
	Primary (ppb)	Secondary (ppb)	Replicate (ppb)	Duplicate (ppb)
<u>1,1,1-Trichloroethane</u>	25	0.3	24	17
Carbon Tetrachloride	0.2	ND	0.2	0.2
Benzene	1.4	<0.4	1.5	1.1
1,2-Dichloroethane	ND	ND	ND	ND
<u>Trichloroethylene</u>	<0.1	ND	<0.2	<0.2
Methyl Isobutyl Ketone	0.2	ND	<0.2	<0.2
Toluene	7.1	0.1	6.9	5.1
<u>Tetrachloroethylene</u>	0.9	<0.1	0.9	0.7
Ethylbenzene	0.8	<0.1	0.9	0.6
Xylenes(total)	5.2	<0.1	4.9	3.7
1,3,5-Trimethylbenzene	3.5	<0.1	3.5	2.5
1,2,4-Trimethylbenzene	5.4	<0.1	5.4	4.0
1,4-Dichlorobenzene	3.7	<0.1	3.4	2.6
Naphthalene	0.6	<0.1	0.6	0.4
Trichlorofluoromethane	6.0	<0.1	3.7	3.0
1,1-Dichloroethylene	1.0	<0.1	3.5	1.0
Methylene Chloride	29	0.8	29	16
Chloroform	0.6	ND	0.3	0.3
Carbon Disulfide	0.2	0.2	ND	ND
Bromomethane	ND	<0.2	ND	ND
Chloroethane	ND	ND	ND	0.8
Acetone	ND	ND	ND	ND

Notes: ND = none detected, compound not detected above the lower limit of detection
 < = less than
 * = compounds identified above detection limits in either of the homes
 Compounds underlined are the compounds that have been identified to be present in groundwater.

The compounds detected above their lower limits of detection, with their maximum concentration in parenthesis, are as follows: 1,1,1-Trichloroethane (25 ppb), Carbon Tetrachloride (0.2 ppb), Benzene (1.5 ppb), Trichloroethylene (<0.2 ppb), Methyl Isobutyl Ketone (0.2 ppb), Toluene (7.1 ppb), Tetrachloroethylene (0.9 ppb), Ethylbenzene (0.9 ppb), Total Xylenes (5.2 ppb), 1,3,5-Trimethylbenzene (3.5 ppb), 1,2,4-Trimethylbenzene (5.4 ppb), 1,4-Dichlorobenzene (3.7 ppb), Napthalene (0.6 ppb), Trichlorofluoromethane (approx. 6.0 ppb), 1,1-Dichloroethylene (approx. 3.5 ppb), Methylene Chloride (approx. 29 ppb), Chloroform (0.6 ppb), Carbon Disulfide (approx. 0.2 ppb), Bromomethane (approx. less than 0.2 ppb), and Chloroethane (approx. 0.8 ppb).

Of the five target compounds which were detected in groundwater, 1,1,1-Trichloroethane, Trichloroethylene, and Tetrachloroethylene were identified to be present in the basement air at low ppb levels (less than 1 ppb), except 1,1,1-Trichloroethane which was detected at 25 ppb. In comparison, previous indoor air studies conducted by this office have shown similar concentrations, except 1,1,1-Trichloroethane, which was 4 to 12 times higher in this study. In general, maximum concentrations for all compounds were below 7 ppb, indicating slightly lower than typical indoor air values. However, 1,1,1-Trichloroethane and Methylene Chloride were detected at much higher levels, 25 ppb and 29 ppb respectively. Given 1,1,1-Trichloroethane is a constituent of several household products, such as those identified in Section 3.2.2, identifying the contaminated groundwater as the only source contributing to the air concentration, can not be made with any certainty.

7.3 REDACTED

Results and Discussion

Table 9 presents the data obtained from the basement on April 27, 1989. Table 14 summarizes the data by listing those compounds identified above their lower limits of detection. Generally, the data are considered to be of sufficient quality to adequately represent the levels individuals would have been exposed to, if present in the basement, during the entire sampling period. The compounds detected above their lower limits of detection, with their maximum concentration in parenthesis, are as follows: 1,1,1-Trichloroethane (2.8ppb), Carbon Tetrachloride (0.2 ppb), Benzene (1.0 ppb), 1,2-Dichloroethane, (0.1 ppb), Methyl Isobutyl Ketone (less than 0.2 ppb), Toluene (6.4 ppb), Tetrachloroethylene (0.6 ppb), Ethylbenzene (0.7 ppb), Total Xylenes (2.7 ppb), 1,3,5-Trimethylbenzene (0.7 ppb), 1,2,4-Trimethylbenzene (0.5 ppb), Napthalene (0.2 ppb), Trichlorofluoromethane (1.2 ppb), 1,1-Dichloroethylene (less than 0.2 ppb), Methylene Chloride (2.5 ppb), Bromomethane (less than 0.4 ppb), and Acetone(approx. 13 ppb).

TABLE 14

REDACTED

EIGHT-HOUR VOLATILE ORGANIC COMPOUND DATA SUMMARY

Compound *	Basement			
	Primary (ppb)	Secondary (ppb)	Replicate (ppb)	Duplicate (ppb)
<u>1,1,1-Trichloroethane</u>	2.8	ND	2.0	1.5
Carbon Tetrachloride	0.2	ND	<0.2	0.2
Benzene	1.0	ND	0.8	0.8
1,2-Dichloroethane	0.1	ND	ND	ND
<u>Trichloroethylene</u>	ND	ND	ND	ND
Methyl Isobutyl Ketone	ND	ND	<0.2	ND
Toluene	6.4	<0.2	4.5	4.1
<u>Tetrachloroethylene</u>	0.6	<0.1	0.4	0.4
Ethylbenzene	0.7	<0.1	0.5	0.4
Xylenes(total)	2.7	<0.1	1.8	1.7
1,3,5-Trimethylbenzene	0.7	<0.1	0.5	0.4
1,2,4-Trimethylbenzene	0.5	<0.1	0.3	0.4
1,4- Dichlorobenzene	ND	ND	ND	ND
Naphthalene	0.2	<0.1	0.2	0.1
Trichlorofluoromethane	1.2	ND	0.6	0.8
1,1-Dichloroethylene	0.1	ND	<0.1	<0.2
Methylene Chloride	2.5	<0.7	1.4	2.1
Chloroform	ND	ND	ND	ND
Carbon Disulfide	ND	ND	ND	ND
Bromomethane	0.15	<0.2	<4.0	0.8
Chloroethane	ND	ND	ND	ND
Acetone	13	ND	9.4	13

Notes: ND = none detected, compound not detected above the lower limit of detection
 < = less than
 * = compounds identified above detection limits in either of the homes
 Compounds underlined are the compounds that have been identified to be present in groundwater.

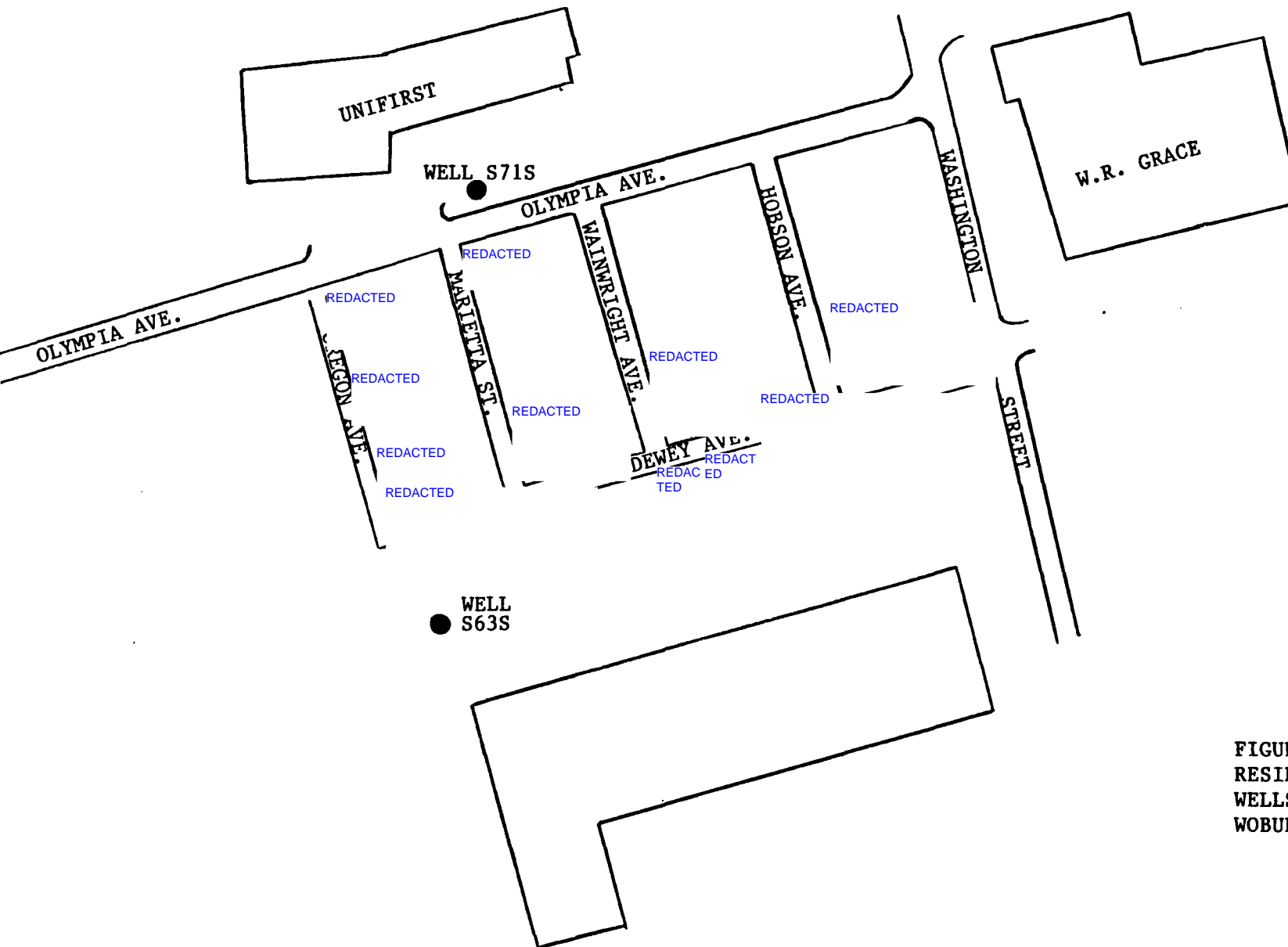
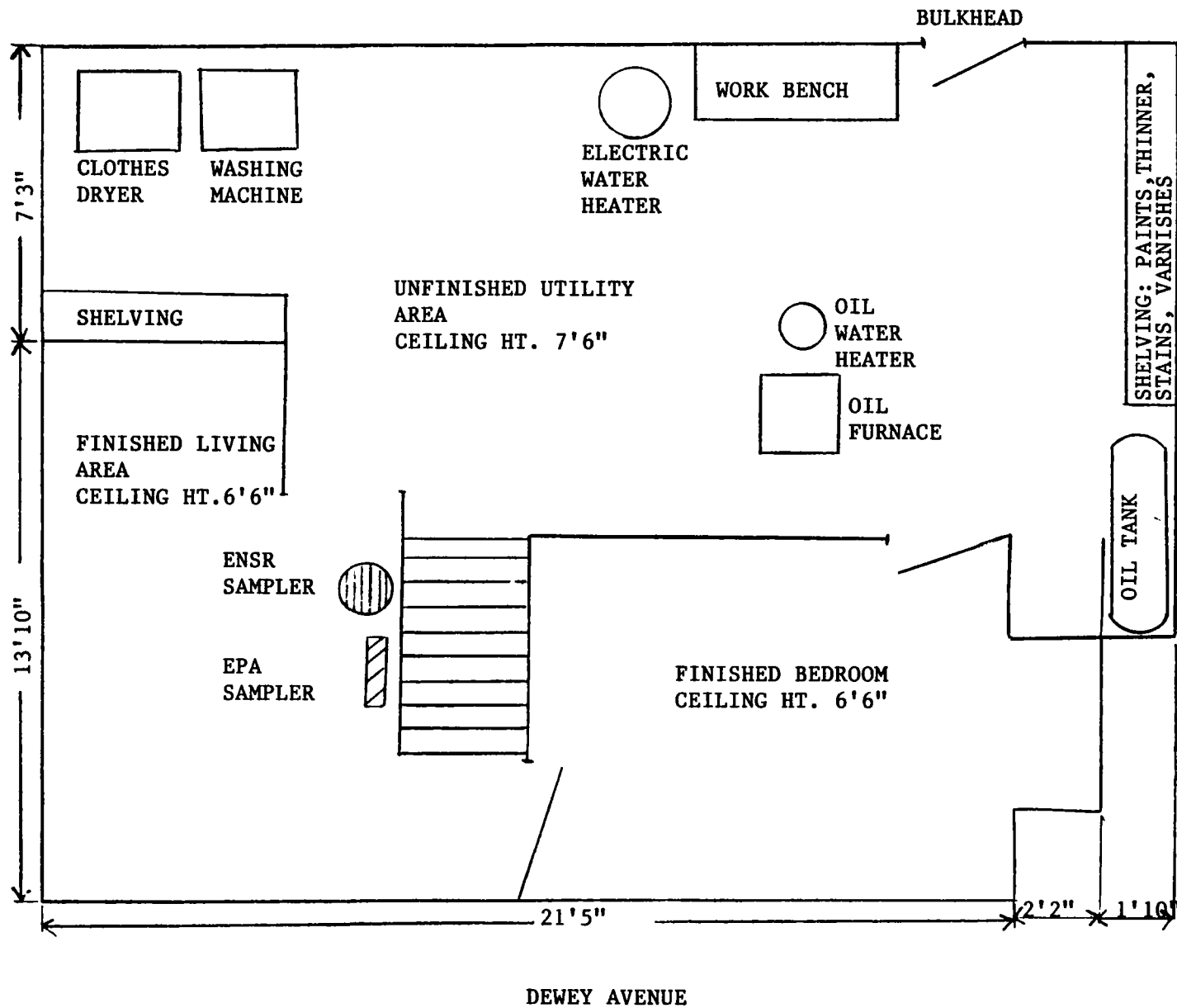


FIGURE 1
RESIDENTIAL AIR SURVEY
WELLS G and H SITE
WOBURN, MA

REDACTED

FIGURE 2 -

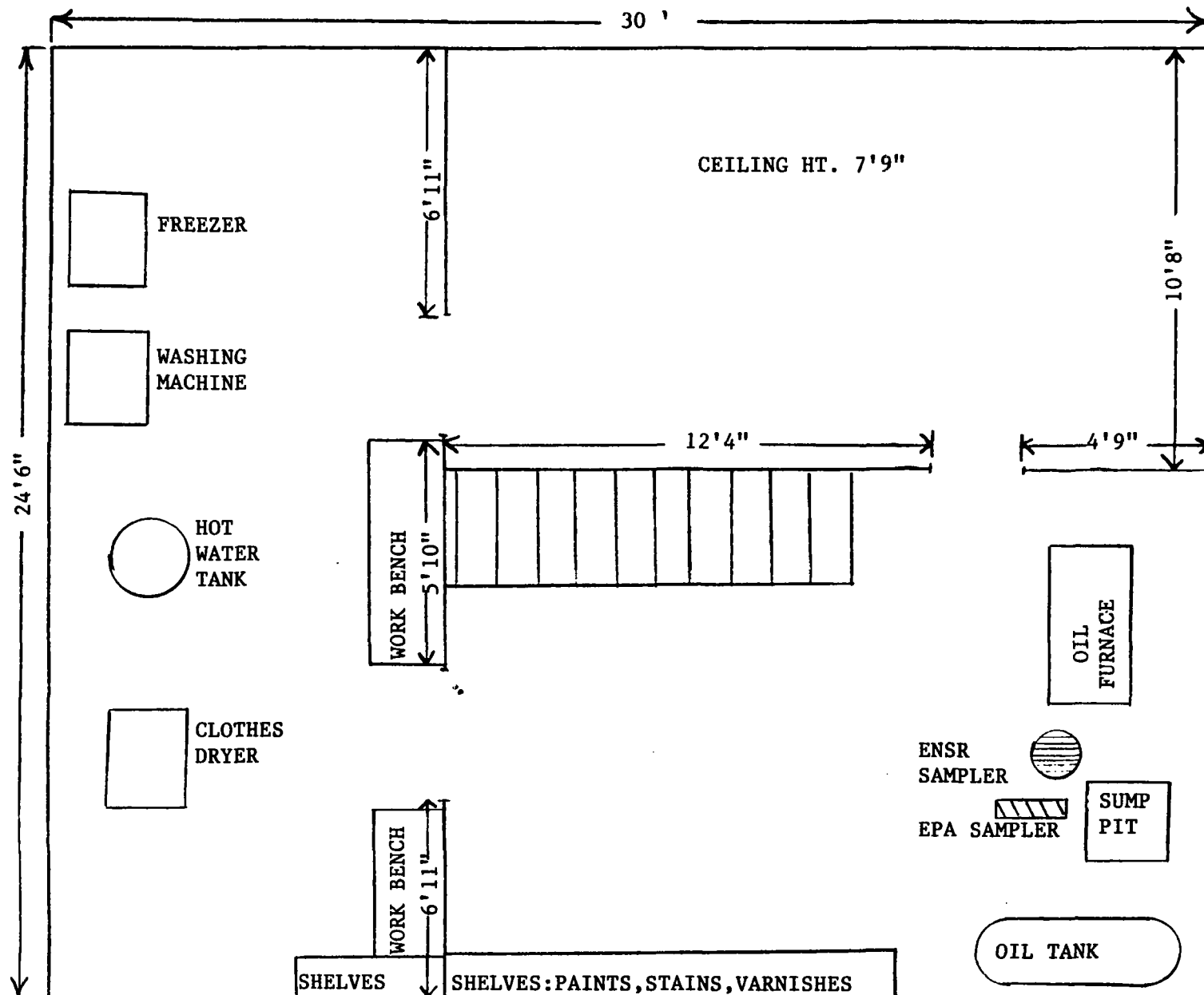
BASEMENT DIAGRAM



SCALE: 1"=4'

FIGURE 3 - REDACTED

BASEMENT DIAGRAM



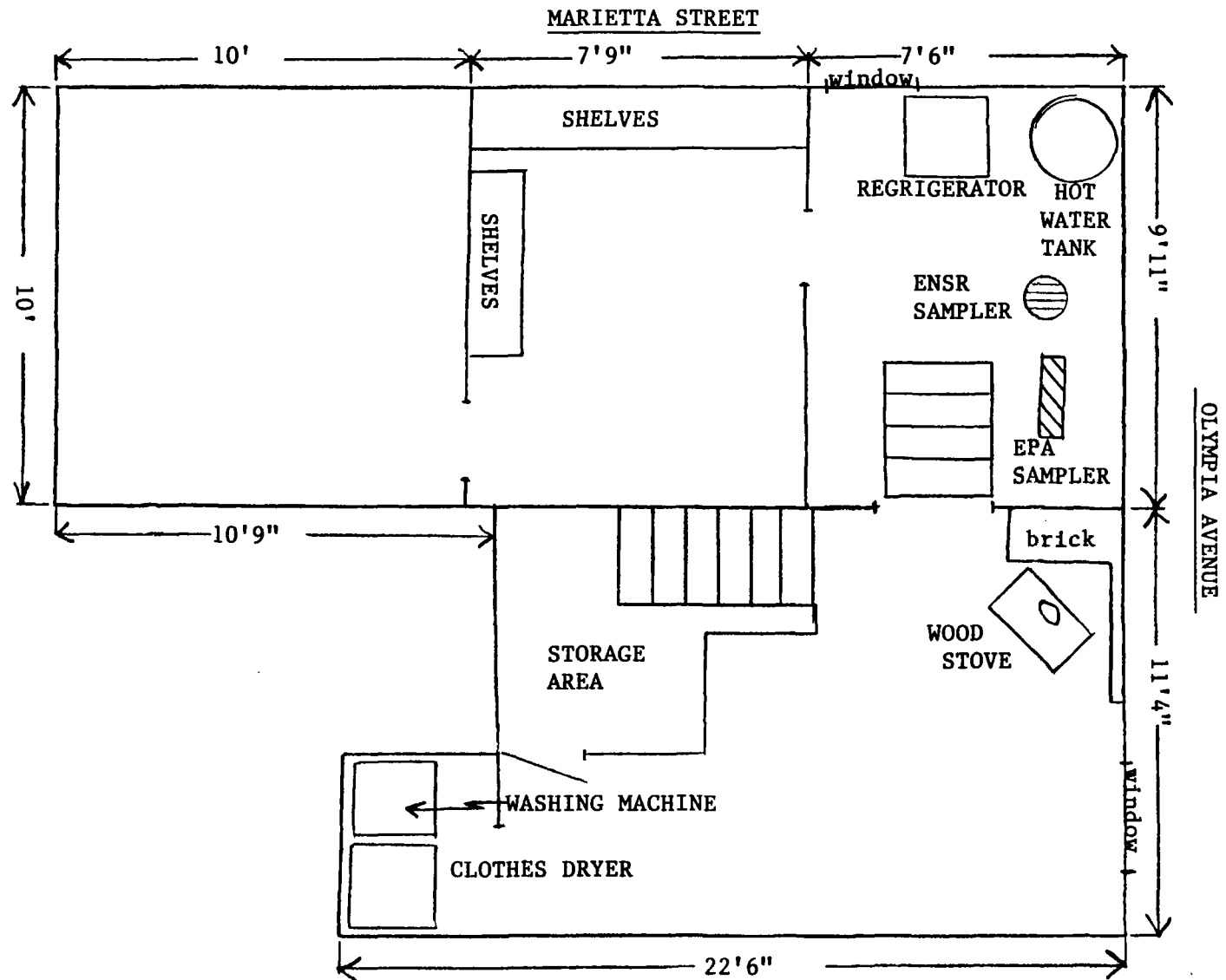
DEWEY AVENUE

SCALE: 1"=4'



FIGURE 4 - REDACTED

BASEMENT DIAGRAM



SCALE: 1"=4'

APPENDIX A

COMPLETED RESIDENTIAL SURVEY QUESTIONNAIRES

WELLS G&H SUPERFUND SITE

WOBURN, MASSACHUSETTS

WOBURN MASSACHUSETTS RESIDENTIAL SURVEY QUESTIONNAIRE

WELLS G&H SUPERFUND SITE

Purpose : The questionnaire is designed to determine which homes have the greatest potential to be affected by volatile organic compounds from groundwater. Air sampling studies will be conducted in two to three homes with the greatest indoor pollution potential.

REDACTED

Name : _____

Address : _____

1. What is the approximate age of the home? 10 Year

2. Is there a basement? (Yes/No) YES

If Yes, please specify whether you have a walk-in or a bulk head entrance to the basement. BULK HEAD ENTRANCE

3. Is the basement finished and utilized as living space? (Yes/No, describe arrangement (bedrooms, family room, etc.)) Approximately how much time is spent daily/weekly in your basement, please specify?

YES. PLAY ROOM FOR CHILDREN IN SUMMER.
3-4 hours / day only / summer

4. Is the basement used as a laundry area and or a workshop? Approximately how much time is spent daily/weekly in the basement, specify?

LAUNDRY / WORKSHOP. 1 hour daily

5. How is the basement/foundation constructed? (poured concrete or dirt floors; poured concrete, concrete block or field stone walls)

POURED CONCRETE

6. What is the structural condition of the basement floor and walls? Are there any visible signs of cracks or holes in the walls or floor?

YES

7. Is there a sump pit sectioned out of the basement floor? (Yes/No)

NO

Does the pit allow water to seep directly into the ground or is it connected to a drain pipe leading to a disposal area?

Describe: _____

8. Does your home have water seepage or flooding problems? (Yes/No)

NO

If so, do you have a sump pump? (Yes or No) _____

How is water infiltrating your basement; via the floor, walls, bulk head?

When was the last time water was visibly present in your basement? Are there any water stains present on the walls or floor?

NO

During what months of the year is your basement wet and approximately how much water is present on the basement floor at any one time?

NO PROBLEMS

9. Additional Comments or Concerns:

THIS IS A TWO FAMILY HOUSE AND
HAS TWO BASEMENT.

Electric Heat

WOBURN MASSACHUSETTS RESIDENTIAL SURVEY QUESTIONNAIRE

WELLS G&H SUPERFUND SITE

Purpose : The questionnaire is designed to determine which homes have the greatest potential to be affected by volatile organic compounds from groundwater. Air sampling studies will be conducted in two to three homes with the greatest indoor pollution potential.

REDACTED

Name :

Address :

1. What is the approximate age of the home? 36 years

2. Is there a basement? (Yes/No) Yes

If Yes, please specify whether you have a walk-in or a bulk head entrance to the basement. Bulk Head

3. Is the basement finished and utilized as living space? (Yes/No, describe arrangement (bedrooms, family room, etc.)) Approximately how much time is spent daily/weekly in your basement, please specify?

Yes, family room used occasionally for entertaining

4. Is the basement used as a laundry area and or a workshop? Approximately how much time is spent daily/weekly in the basement, specify?

used as laundry area, ~2 hours/week

5. How is the basement/foundation constructed? (poured concrete or dirt floors; poured concrete, concrete block or field stone walls)

Poured concrete floor, carpet covers floor
Concrete block walls, walls are paneled

6. What is the structural condition of the basement floor and walls? Are there any visible signs of cracks or holes in the walls or floor?

Walls and floor are covered.

7. Is there a sump pit sectioned out of the basement floor? (Yes/No)

No sump pit. However, there is a 1x2 ft section out of floor
where the sewage line comes in, there is exposed dirt.

Does the pit allow water to seep directly into the ground or is it connected to a drain pipe leading to a disposal area?

Describe: This section is near laundry area, if problem
with washing machine or water heater water would drain
directly into ground.

8. Does your home have water seepage or flooding problems? (Yes/No)

No

If so, do you have a sump pump? (Yes or No) _____

How is water infiltrating your basement; via the floor, walls, bulk head?

No water is infiltrating basement

When was the last time water was visibly present in your basement? Are there any water stains present on the walls or floor?

No water problem, no stains present.

During what months of the year is your basement wet and approximately how much water is present on the basement floor at any one time?

No water problem

9. Additional Comments or Concerns:

Questionnaire filled out by Peter Kahn and

REDACTED

She does not have a problem with EPA conducting
a study in her home the week of April 24th. They
are retired and are usually at home.

WOBURN MASSACHUSETTS RESIDENTIAL SURVEY QUESTIONNAIRE

WELLS G&H SUPERFUND SITE

Purpose : The questionnaire is designed to determine which homes have the greatest potential to be affected by volatile organic compounds from groundwater. Air sampling studies will be conducted in two to three homes with the greatest indoor pollution potential.

REDACTED

Name :

Address :

1. What is the approximate age of the home? 40

2. Is there a basement? (Yes/No) YES

If Yes, please specify whether you have a walk-in or a bulk head entrance to the basement. NO OUTSIDE ENTRANCE

3. Is the basement finished and utilized as living space? (Yes/No, describe arrangement (bedrooms, family room, etc.)) Approximately how much time is spent daily/weekly in your basement, please specify?

UNFINISHED - DAILY USE - 1 HR APPROX

WEEKLY USE - 10 HRS APPROX

4. Is the basement used as a laundry area and or a workshop? Approximately how much time is spent daily/weekly in the basement, specify?

LAUNDRY AND WORKSHOP - APPROX 10 HRS / WEEK

5. How is the basement/foundation constructed? (poured concrete or dirt floors; poured concrete, concrete block or field stone walls)

POURED CONCRETE FOUNDATION AND FLOOR
CONCRETE BLOCK ATOP FOUNDATION

6. What is the structural condition of the basement floor and walls? Are there any visible signs of cracks or holes in the walls or floor?

GOOD CONDITION / SOME VISIBLE FLOOR CRACKS

7. Is there a sump pit sectioned out of the basement floor? (Yes/No)

YES

Does the pit allow water to seep directly into the ground or is it connected to a drain pipe leading to a disposal area?

Describe: EMPTIES DIRECTLY INTO GROUND

8. Does your home have water seepage or flooding problems? (Yes/No)

ONLY WHEN SEVERAL DAYS OF HEAVY CONTINUOUS RAIN

If so, do you have a sump pump? (Yes or No) YES

How is water infiltrating your basement; via the floor, walls, bulk head?

FLOOR / WALLS?

When was the last time water was visibly present in your basement? Are there any water stains present on the walls or floor?

MAYBE 4 YEARS AGO

60

During what months of the year is your basement wet and approximately how much water is present on the basement floor at any one time?

NO PARTICULAR MONTH (SPRING, FALL) WHEN
CONTINUOUS HEAVY RAIN FOR SEVERAL DAYS.

9. Additional Comments or Concerns:

MOST WATER SEEMS TO COME FROM STREET
AND DOWN DRIVEWAY

WOBURN MASSACHUSETTS RESIDENTIAL SURVEY QUESTIONNAIRE

WELLS G&H SUPERFUND SITE

Purpose : The questionnaire is designed to determine which homes have the greatest potential to be affected by volatile organic compounds from groundwater. Air sampling studies will be conducted in two to three homes with the greatest indoor pollution potential.

REDACTED

Name :

Address :

1. What is the approximate age of the home? 85 YRS.

2. Is there a basement? (Yes/No) YES

If Yes, please specify whether you have a walk-in or a bulk head entrance to the basement. WITH WALK IN
APPROX. 2 FT ABOVE FLOOR.

3. Is the basement finished and utilized as living space? (Yes/No, describe arrangement (bedrooms, family room, etc.)) Approximately how much time is spent daily/weekly in your basement, please specify?

NO. 1/2 HR WEEK, LAUNDRY

4. Is the basement used as a laundry area and or a workshop? Approximately how much time is spent daily/weekly in the basement, specify?

SAME AS THREE (3)

5. How is the basement/foundation constructed? (poured concrete or dirt floors; poured concrete, concrete block or field stone walls)

FIELD STONE - CONCRETE FLOOR.

6. What is the structural condition of the basement floor and walls? Are there any visible signs of cracks or holes in the walls or floor?

YES - BOTH

7. Is there a sump pit sectioned out of the basement floor? (Yes/No)

NO

Does the pit allow water to seep directly into the ground or is it connected to a drain pipe leading to a disposal area?

Describe: _____

8. Does your home have water seepage or flooding problems? (Yes/No)

NO

If so, do you have a sump pump? (Yes or No) _____

How is water infiltrating your basement; via the floor, walls, bulk head?

When was the last time water was visibly present in your basement? Are there any water stains present on the walls or floor?

NONE

During what months of the year is your basement wet and approximately how much water is present on the basement floor at any one time?

9. Additional Comments or Concerns:

SOIL ON PROPERTY IS STONE & SAND
MIXTURE, VERY LITTLE CLAY.

WOBURN MASSACHUSETTS RESIDENTIAL SURVEY QUESTIONNAIRE

WELLS G&H SUPERFUND SITE

Purpose : The questionnaire is designed to determine which homes have the greatest potential to be affected by volatile organic compounds from groundwater. Air sampling studies will be conducted in two to three homes with the greatest indoor pollution potential.

REDACTED

Name :

Address :

1. What is the approximate age of the home? 78 years
2. Is there a basement? (Yes/No) Yes. partially. crawl space under kitchen
If Yes, please specify whether you have a walk-in or a bulk head entrance to the basement. No access from outside
3. Is the basement finished and utilized as living space? (Yes/No, describe arrangement (bedrooms, family room, etc.)) Approximately how much time is spent daily/weekly in your basement, please specify?
No
4. Is the basement used as a laundry area and or a workshop? Approximately how much time is spent daily/weekly in the basement, specify?
Laundry area, ~ 1 hour / day, 10 hours / week

5. How is the basement/foundation constructed? (poured concrete or dirt floors; poured concrete, concrete block or field stone walls)

Poured concrete floor and walls

6. What is the structural condition of the basement floor and walls? Are there any visible signs of cracks or holes in the walls or floor?

Some holes and cracks in floor, some cracks in walls.

7. Is there a sump pit sectioned out of the basement floor? (Yes/No)

No sump pit. However, there is a section out of floor where sewage pipe comes into house, there is exposed dirt.

Does the pit allow water to seep directly into the ground or is it connected to a drain pipe leading to a disposal area?

Describe: This section is near laundry machine, if problem water would drain directly into ground.

8. Does your home have water seepage or flooding problems? (Yes/No)

No.

If so, do you have a sump pump? (Yes or No) _____

How is water infiltrating your basement; via the floor, walls, bulk head?

No water is infiltrating basement

When was the last time water was visibly present in your basement? Are there any water stains present on the walls or floor?

No water problem. However, I did notice some water stains on walls.

During what months of the year is your basement wet and approximately how much water is present on the basement floor at any one time?

No water problem

9. Additional Comments or Concerns:

REDACTED

Questionnaire filled out by Peter Rahn and

REDACTED

He does not have a problem with EPA conducting a study the week of April 24th. No one is home during the day, however arrangements could be made.

There were visible signs of paints (latex).

They have gas / hot water heating system.

WOBURN MASSACHUSETTS RESIDENTIAL SURVEY QUESTIONNAIRE

WELLS G&H SUPERFUND SITE

Purpose : The questionnaire is designed to determine which homes have the greatest potential to be affected by volatile organic compounds from groundwater. Air sampling studies will be conducted in two to three homes with the greatest indoor pollution potential.

REDACTED

Name :

Address :

1. What is the approximate age of the home? 38 yrs

2. Is there a basement? (Yes/No) yes

If Yes, please specify whether you have a walk-in or a bulk head entrance to the basement. Bulk head

3. Is the basement finished and utilized as living space? (Yes/No, describe arrangement (bedrooms, family room, etc.)) Approximately how much time is spent daily/weekly in your basement, please specify?

NO

4. Is the basement used as a laundry area and or a workshop? Approximately how much time is spent daily/weekly in the basement, specify?

Yes. laundry 1 hr week

5. How is the basement/foundation constructed? (poured concrete or dirt floors; poured concrete, concrete block or field stone walls)

poured concrete

6. What is the structural condition of the basement floor and walls? Are there any visible signs of cracks or holes in the walls or floor?

no

7. Is there a sump pit sectioned out of the basement floor? (Yes/No)

no

Does the pit allow water to seep directly into the ground or is it connected to a drain pipe leading to a disposal area?

Describe: _____

8. Does your home have water seepage or flooding problems? (Yes/No)

no

If so, do you have a sump pump? (Yes or No) _____

How is water infiltrating your basement; via the floor, walls, bulk head?

When was the last time water was visibly present in your basement? Are there any water stains present on the walls or floor?

During what months of the year is your basement wet and approximately how much water is present on the basement floor at any one time?

9. Additional Comments or Concerns:

Oil furnace, hot water, oil tank in basement,
A few cans of paints, varnishes, etc. in basement

WOBURN MASSACHUSETTS RESIDENTIAL SURVEY QUESTIONNAIRE

WELLS G&H SUPERFUND SITE

Purpose : The questionnaire is designed to determine which homes have the greatest potential to be affected by volatile organic compounds from groundwater. Air sampling studies will be conducted in two to three homes with the greatest indoor pollution potential.

REDACTED

Name : _____

Address : _____

1. What is the approximate age of the home? 37 years

2. Is there a basement? (Yes/No) Yes

If Yes, please specify whether you have a walk-in or a bulk head entrance to the basement. Bulk Head

3. Is the basement finished and utilized as living space? (Yes/No, describe arrangement (bedrooms, family room, etc.)) Approximately how much time is spent daily/weekly in your basement, please specify?

Half is finished, utility (washer/dryer), work shop area.
In winter time 8 hours /week, not at all in summer.

4. Is the basement used as a laundry area and or a workshop? Approximately how much time is spent daily/weekly in the basement, specify?

Laundry area, 1 hour/week

5. How is the basement/foundation constructed? (poured concrete or dirt floors; poured concrete, concrete block or field stone walls)

Poured concrete floors, partially concrete block and poured walls

6. What is the structural condition of the basement floor and walls? Are there any visible signs of cracks or holes in the walls or floor?

Floors and walls covered with paint and or sheet rock (walls)

7. Is there a sump pit sectioned out of the basement floor? (Yes/No)

No pit, There is however a drain in the floor near washing machine, drains directly into ground.

Does the pit allow water to seep directly into the ground or is it connected to a drain pipe leading to a disposal area?

Describe: Drain, allows water to go directly into ground.

8. Does your home have water seepage or flooding problems? (Yes/No)

No.

If so, do you have a sump pump? (Yes or No) No pump

How is water infiltrating your basement; via the floor, walls, bulk head?

No problems

When was the last time water was visibly present in your basement? Are there any water stains present on the walls or floor?

No water problems

During what months of the year is your basement wet and approximately how much water is present on the basement floor at any one time?

No water problems

9. Additional Comments or Concerns:

REDACTED

Filled out questionnaire with on 4-18-89.
wouldn't object to study, Wed or Thurs. is good; contact
before Friday April 21.
Gas / hot water heat.

WOBURN MASSACHUSETTS RESIDENTIAL SURVEY QUESTIONNAIRE

WELLS G&H SUPERFUND SITE

Purpose : The questionnaire is designed to determine which homes have the greatest potential to be affected by volatile organic compounds from groundwater. Air sampling studies will be conducted in two to three homes with the greatest indoor pollution potential.

REDACTED

Name :

Address :

1. What is the approximate age of the home? 40 +

2. Is there a basement? (Yes/No) Yes

If Yes, please specify whether you have a walk-in or a bulk head entrance to the basement. Bulk head

3. Is the basement finished and utilized as living space? (Yes/No, describe arrangement (bedrooms, family room, etc.)) Approximately how much time is spent daily/weekly in your basement, please specify?

Partially, No one at this time
Bedroom

4. Is the basement used as a laundry area and or a workshop? Approximately how much time is spent daily/weekly in the basement, specify?

Yes, 5 hrs Laundry/weekly

5. How is the basement/foundation constructed? (poured concrete or dirt floors; poured concrete, concrete block or field stone walls)

poured concrete

6. What is the structural condition of the basement floor and walls? Are there any visible signs of cracks or holes in the walls or floor?

Some in walls

7. Is there a sump pit sectioned out of the basement floor? (Yes/No)

yes, covered by floor steel + carpet

Does the pit allow water to seep directly into the ground or is it connected to a drain pipe leading to a disposal area?

Describe: into the ground

8. Does your home have water seepage or flooding problems? (Yes/No)

Not any more

If so, do you have a sump pump? (Yes or No) yes, no longer

How is water infiltrating your basement; via the floor, walls, bulk head?

Bulk head, very little

When was the last time water was visibly present in your basement? Are there any water stains present on the walls or floor?

5 yrs ago, no stains present

During what months of the year is your basement wet and approximately how much water is present on the basement floor at any one time?

Jan, Feb, Thaw $\frac{1}{2}$ inch

9. Additional Comments or Concerns:

WOBURN MASSACHUSETTS RESIDENTIAL SURVEY QUESTIONNAIRE

WELLS G&H SUPERFUND SITE

Purpose : The questionnaire is designed to determine which homes have the greatest potential to be affected by volatile organic compounds from groundwater. Air sampling studies will be conducted in two to three homes with the greatest indoor pollution potential.

REDACTED

Name :

Address :

1. What is the approximate age of the home? 37 years, house moved to current location 10 years ago

2. Is there a basement? (Yes/No) Yes

If Yes, please specify whether you have a walk-in or a bulk head entrance to the basement. walk-in

3. Is the basement finished and utilized as living space? (Yes/No, describe arrangement (bedrooms, family room, etc.)) Approximately how much time is spent daily/weekly in your basement, please specify?

Finished used as apartment, occupant works all day only there in evening & weekends ~ 13 hours / day

4. Is the basement used as a laundry area and or a workshop? Approximately how much time is spent daily/weekly in the basement, specify?

A portion of basement apartment used as laundry room, utility room.

5. How is the basement/foundation constructed? (poured concrete or dirt floors; poured concrete, concrete block or field stone walls)

Poured concrete floor, poured walls, top 3' (above ground)
is concrete block.

6. What is the structural condition of the basement floor and walls? Are there any visible signs of cracks or holes in the walls or floor?

No signs of cracks or holes

7. Is there a sump pit sectioned out of the basement floor? (Yes/No)

No.

Does the pit allow water to seep directly into the ground or is it connected to a drain pipe leading to a disposal area?

Describe: _____

8. Does your home have water seepage or flooding problems? (Yes/No)

No water problems

If so, do you have a sump pump? (Yes or No) _____

How is water infiltrating your basement; via the floor, walls, bulk head?

No water is infiltrating basement

When was the last time water was visibly present in your basement? Are there any water stains present on the walls or floor?

No water problem or stains present

During what months of the year is your basement wet and approximately how much water is present on the basement floor at any one time?

No water problem.

9. Additional Comments or Concerns:

Questionnaire filled out by Peter Kahn and REDACTED
REDACTED

He does not have problem with EPA conducting
study.

He is retired and is home most of the time.

WOBURN MASSACHUSETTS RESIDENTIAL SURVEY QUESTIONNAIRE

WELLS G&H SUPERFUND SITE

Purpose : The questionnaire is designed to determine which homes have the greatest potential to be affected by volatile organic compounds from groundwater. Air sampling studies will be conducted in two to three homes with the greatest indoor pollution potential.

REDACTED

Name :

Address :

1. What is the approximate age of the home? Built 1934 (55 years), They have lived there for ~ 29 years.

2. Is there a basement? (Yes/No) Yes

If Yes, please specify whether you have a walk-in or a bulk head entrance to the basement. Bulk Head

3. Is the basement finished and utilized as living space? (Yes/No, describe arrangement (bedrooms, family room, etc.)) Approximately how much time is spent daily/weekly in your basement, please specify?

No, it is not finished

4. Is the basement used as a laundry area and or a workshop? Approximately how much time is spent daily/weekly in the basement, specify?

Laundry area and workshop, 5 hours / week
Caged birds are present in basement hobbie.
The owner says they are healthy.

5. How is the basement/foundation constructed? (poured concrete or dirt floors; poured concrete, concrete block or field stone walls)

Concrete block walls, poured concrete floor

6. What is the structural condition of the basement floor and walls? Are there any visible signs of cracks or holes in the walls or floor?

Few cracks in floor, none on walls

7. Is there a sump pit sectioned out of the basement floor? (Yes/No)

No sump pit. There is a drain near bulk head entrance.

Does the pit allow water to seep directly into the ground or is it connected to a drain pipe leading to a disposal area?

Describe: This drain allows water to seep directly into ground.

8. Does your home have water seepage or flooding problems? (Yes/No)

No

If so, do you have a sump pump? (Yes or No) _____

How is water infiltrating your basement; via the floor, walls, bulk head?

No water infiltrating basement

When was the last time water was visibly present in your basement? Are there any water stains present on the walls or floor?

No water problem, no stains present

During what months of the year is your basement wet and approximately how much water is present on the basement floor at any one time?

No water problem

9. Additional Comments or Concerns:

REDACTED

REDACTED Questionnaire filled out by Peter Kahn and

They do not have problem with EPA conducting
a study the week of April 24th. They are retired
and are usually at home

They have a gas / hot water heating system.

WOBURN MASSACHUSETTS RESIDENTIAL SURVEY QUESTIONNAIRE

WELLS G&H SUPERFUND SITE

Purpose : The questionnaire is designed to determine which homes have the greatest potential to be affected by volatile organic compounds from groundwater. Air sampling studies will be conducted in two to three homes with the greatest indoor pollution potential.

REDACTED

Name :

Address :

1. What is the approximate age of the home? 50 yrs

2. Is there a basement? (Yes/No) Yes

If Yes, please specify whether you have a walk-in or a bulk head entrance to the basement. WALK IN

3. Is the basement finished and utilized as living space? (Yes/No, describe arrangement (bedrooms, family room, etc.)) Approximately how much time is spent daily/weekly in your basement, please specify?

No

4. Is the basement used as a laundry area and or a workshop? Approximately how much time is spent daily/weekly in the basement, specify?

LAUNDRY & WORKSHOP

5. How is the basement/foundation constructed? (poured concrete or dirt floors; poured concrete, concrete block or field stone walls)

Concrete Blocks

6. What is the structural condition of the basement floor and walls? Are there any visible signs of cracks or holes in the walls or floor?

No

7. Is there a sump pit sectioned out of the basement floor? (Yes/No)

Yes

Does the pit allow water to seep directly into the ground or is it connected to a drain pipe leading to a disposal area?

Describe: _____

8. Does your home have water seepage or flooding problems? (Yes/No)

No

If so, do you have a sump pump? (Yes or No) yes

How is water infiltrating your basement; via the floor, walls, bulk head?

No WATER Problem in CELLAR

When was the last time water was visibly present in your basement? Are there any water stains present on the walls or floor?

AROUND 1950

During what months of the year is your basement wet and approximately how much water is present on the basement floor at any one time?

None

9. Additional Comments or Concerns:

No Problems

WOBURN MASSACHUSETTS RESIDENTIAL SURVEY QUESTIONNAIRE

WELLS G&H SUPERFUND SITE

Purpose : The questionnaire is designed to determine which homes have the greatest potential to be affected by volatile organic compounds from groundwater. Air sampling studies will be conducted in two to three homes with the greatest indoor pollution potential.

REDACTED

Name :

Address :

1. What is the approximate age of the home? 60 yrs

2. Is there a basement? (Yes/No) YES

If Yes, please specify whether you have a walk-in or a bulk head entrance to the basement. Walk IN

3. Is the basement finished and utilized as living space? (Yes/No, describe arrangement (bedrooms, family room, etc.)) Approximately how much time is spent daily/weekly in your basement, please specify?

YES 2-3 HOURS DAILY

4. Is the basement used as a laundry area and or a workshop? Approximately how much time is spent daily/weekly in the basement, specify?

YES SAME AS ABOVE

5. How is the basement/foundation constructed? (poured concrete or dirt floors; poured concrete, concrete block or field stone walls)

Concrete Block AND STONE WALLS W/POURED
CONCRETE FLOOR

6. What is the structural condition of the basement floor and walls? Are there any visible signs of cracks or holes in the walls or floor?

A FLOOR DRAIN IN ONE PLACE AND A FEW CRACKS

7. Is there a sump pit sectioned out of the basement floor? (Yes/No)

No

Does the pit allow water to seep directly into the ground or is it connected to a drain pipe leading to a disposal area?

Describe: _____

8. Does your home have water seepage or flooding problems? (Yes/No)

YES

If so, do you have a sump pump? (Yes or No) No

How is water infiltrating your basement; via the floor, walls, bulk head?

EITHER THE WALLS OR THE FLOOR

When was the last time water was visibly present in your basement? Are there any water stains present on the walls or floor?

TODAY 4-17-89. YES

During what months of the year is your basement wet and approximately how much water is present on the basement floor at any one time?

IT'S ALWAYS DAMP. NO MORE THAN A FEW
GALLONS

9. Additional Comments or Concerns:

I WOULD LIKE TO SEE ALL HOUSES IN THIS
NEIGHBORHOOD TESTED BECAUSE OF THE
PROXIMITY TO THE GRACE AND UNIFIRST
PROPERTIES

WOBURN MASSACHUSETTS RESIDENTIAL SURVEY QUESTIONNAIRE

WELLS G&H SUPERFUND SITE

Purpose : The questionnaire is designed to determine which homes have the greatest potential to be affected by volatile organic compounds from groundwater. Air sampling studies will be conducted in two to three homes with the greatest indoor pollution potential.

REDACTED

Name :

Address :

1. What is the approximate age of the home? 8 years

2. Is there a basement? (Yes/No) Yes

If Yes, please specify whether you have a walk-in or a bulk head entrance to the basement. walk-in

3. Is the basement finished and utilized as living space? (Yes/No, describe arrangement (bedrooms, family room, etc.)) Approximately how much time is spent daily/weekly in your basement, please specify?

No, basement is not finished

4. Is the basement used as a laundry area and or a workshop? Approximately how much time is spent daily/weekly in the basement, specify?

Laundry and workshop, 1-2 hours / week

5. How is the basement/foundation constructed? (poured concrete or dirt floors; poured concrete, concrete block or field stone walls)

Poured concrete floor and walls

6. What is the structural condition of the basement floor and walls? Are there any visible signs of cracks or holes in the walls or floor?

No visible signs of cracks or holes in walls or floor.

7. Is there a sump pit sectioned out of the basement floor? (Yes/No)

No.

Does the pit allow water to seep directly into the ground or is it connected to a drain pipe leading to a disposal area?

Describe: _____

8. Does your home have water seepage or flooding problems? (Yes/No)

No.

If so, do you have a sump pump? (Yes or No) _____

How is water infiltrating your basement; via the floor, walls, bulk head?

No water infiltrating basement

When was the last time water was visibly present in your basement? Are there any water stains present on the walls or floor?

No water problem, no stains

Approximately 2-3 years ago surface water infiltrated basement, the problem was readily fixed.

During what months of the year is your basement wet and approximately how much water is present on the basement floor at any one time?

No water problem

9. Additional Comments or Concerns:

Questionnaire filled out by Peter Kahn and

REDACTED

He does not have problem with EPA conducting
study.

He is retired and is home most of the time

WOBURN MASSACHUSETTS RESIDENTIAL SURVEY QUESTIONNAIRE

WELLS G&H SUPERFUND SITE

Purpose : The questionnaire is designed to determine which homes have the greatest potential to be affected by volatile organic compounds from groundwater. Air sampling studies will be conducted in two to three homes with the greatest indoor pollution potential.

REDACTED

Name :

Address :

1. What is the approximate age of the home? 4 years

2. Is there a basement? (Yes/No) Yes

If Yes, please specify whether you have a walk-in or a bulk head entrance to the basement. walk-in

3. Is the basement finished and utilized as living space? (Yes/No, describe arrangement (bedrooms, family room, etc.)) Approximately how much time is spent daily/weekly in your basement, please specify?

No, basement is not finished

4. Is the basement used as a laundry area and or a workshop? Approximately how much time is spent daily/weekly in the basement, specify?

Laundry area and workshop, 3-4 hours / week

5. How is the basement/foundation constructed? (poured concrete or dirt floors; poured concrete, concrete block or field stone walls)

Poured concrete floors and walls

6. What is the structural condition of the basement floor and walls? Are there any visible signs of cracks or holes in the walls or floor?

A few hair-line cracks on walls.

7. Is there a sump pit sectioned out of the basement floor? (Yes/No)

No.

Does the pit allow water to seep directly into the ground or is it connected to a drain pipe leading to a disposal area?

Describe: _____

8. Does your home have water seepage or flooding problems? (Yes/No)

No

If so, do you have a sump pump? (Yes or No) _____

How is water infiltrating your basement; via the floor, walls, bulk head?

No water infiltrating basement

When was the last time water was visibly present in your basement? Are there any water stains present on the walls or floor?

No water problem, no stains

During what months of the year is your basement wet and approximately how much water is present on the basement floor at any one time?

No water problem

9. Additional Comments or Concerns:

Questionnaire filled out by Peter Kahn and

REDACTED

He does not have problem with EPA conducting study.

He is retired and is home most of the time.